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MODEL AIRPLANE NEWS

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DECEMBER 1986 VOLUME 113, NUMBER 6

MODEL AIRPLANE NEWS

ABOVE: Gene Soucy, Tom Poberezny, and Charley Hilliard wow the crowd at Byron's bash in their famous Christen Eagles. Story begins on page 20. Photo by Art Schroeder.
ON THE COVER: The Futaba FP-T8SSA-P/8 single-stick PCM transmitter is the epitome of sophistication and a wonderful example of the tremendous technological advancements made in our hobby in the past few years. This radio, plus many more, is briefly described in "Radio Control Transmitter Consumer Guide" commencing on page 27. Photo by Arce Studios.

FEATURES

CONSTRUCTION

COLUMNS

DEPARTMENTS

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Editorial

by DAN SANTICH

INSPIRATION AND MODELING. Have you ever asked yourself "How many more new models can there be?" When do we run out of ideas? When does everything become simply a duplication of something else? Believe it or not, Mozart asked this very question concerning his music.

Modeling is like playing a piano, a baby grand if you wish. It is infinite in its tone, range of expression, and quality. For any musician, the vivacity of a composition is demonstrated by the feeling and technical skill he puts into it. And modeling is like playing the same song, one composed by another musician. Different styles, chords, and time can bring a different tune from the same notes. And isn't that true also of modeling?

In the world of modeling we have some of the greatest "musicians" around. They play their instruments in harmony with our senses and even provide a place for joining in the rhapsody, a combining of modeling musicians that would rival the New York Philharmonic. Can you join them? Certainly. A sour note or an off-tune chord doesn't bother them as they're immersed in overall enjoyment of the art. Your contribution to the world of modeling really makes the symphony more beautiful, and more enjoyable. So join in: the maestro is about to strike his wand.

THIS MONTH. The hobby of Radio Control revolves around a central and vital ingredient—the radio system. This one element has changed the hobby to such a degree that it will never be the same again.

Although relatively slow in its coming (over 40 years), the growth of R/C has been explosive in the past three years. Modelers joining our ranks today know little about the systems' innerds or workings, nor need they. But all of the systems featured in this issue came from a single seed. The sprout had many spindly branches, yet all have ultimately contributed to our success. Many have died, yet even in their passing gave us knowledge to build upon. As you view the system featured in this issue, give thanks to the Bonners and Goods, the Worths and deBolts and the hundreds of others who gave so much to the hobby, for without their contribution our hobby would not be as wonderful as it is today.

For the scratch-builder who wants a fun airplane that looks great and flys even better, the AeroFox should do the job nicely. Byron's Pipe Dream is no longer a dream but a reality, and Art Schroeder had a ball with it, as reflected in his review of the kit.

The central theme of this issue is radio systems. The reliability of present sets is such that the hobby can only thrive and benefit from them. We are in debt to those individuals who had the forethought and perseverence to bring us these marvels, and it is to them that we dedicate this issue. ■

Airwaves

The Next 45 Will Be Even Better!

I'm a scale R/C model builder. From newstands to subscriptions, *Model Airplane News* has been in my workshop every month for 45 years. But now I'm late in my renewal. One reason for this is that R/C scale models are larger and heavier, and their construction an all-new ball game.

Also, I'd like to see more in R/C scale construction detail, scale ideas and three-view plans from "Golden Age of R/C" era—with centerfold pictures of each plan model of the month, and full-size aircraft pictures for plan detail.

ANTHONY COSTANZO
Methuen, MA

How about this issue? DBS

Enclosed is my renewal form and money for a two-year subscription. I obviously enjoy your magazine, otherwise I wouldn't renew. But I do have one or two remarks: Please leave the real planes out of the MODEL *Airplane News*—If I want to know more about the BIG brothers, I'll buy a real airplane magazine. And, please, leave the cars out.

C. FLINK
Reitsum, Holland

Let's hear it. How many others feel this way? DBS

Budd's For You

Budd Davisson is great! What a way with words—the freshest style of anyone I've ever read. Each column is better than the last. He'll have everyone signing up for flying lessons.

ROY McGUCKIN
Fairport, NY

We like him too! DBS

You're In!

Just a few lines to tell you how much we enjoy reading *Model Airplane News*—and to send you a few pictures of our latest models.

Doug Norris and I have been in model-building for many years, but this is the first time we've sent pictures to a magazine, and hope to get them printed. As you can see, one of them is a scratch-built Super Hots (right), which Doug Norris built from prints we ordered—it's his first scratch-built ever, and it flies great. It's powered by a Como 51 ABC, but we're going to a Super Tigre 61 for more power; for control, it has a JR Century 7.

The plane I've built (left) is a Balsa USA Moonraker powered by a Super Tigre 45 and uses Airtronics for control. Both planes flew right off the board with only minor trim. Also, we both built the 40-size Hots and had a ball with them—keep up your great designs that are fun to build and fly.

DOUGLAS NORRIS,
JOHN STRICKLAND
Goldsboro, NC

Pictures are welcome. Thanks for sending. DBS

Passing on the Legacy

I've been meaning to write and say how much I enjoyed "Big Engine Shootout" in the April 1986 *M.A.N.* It's the best I've read in the last two years that I've returned to modeling.

Also, I have eight grandsons and two grandaughters who are learning to fly and would like to see more "Tech Tips" and related items.

COL. BILL WEBB (RET.)
Columbus, Ohio

Fast Richard's Legacy Still Haunts Us

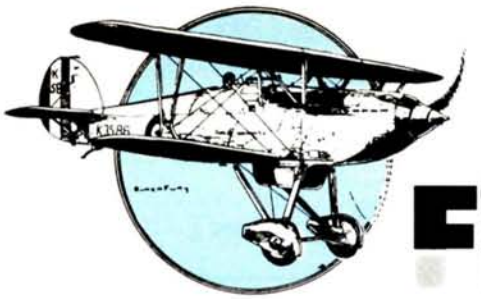
Reader Bob Saxon's memory (Letter to the Editor, Sept. '86) obviously had some indelible impressions left upon it by one of the more colorful figures in recent modeldom, Dick (Fast Richard) Mathis, who appeared from time to time in all of the major model magazines. Claiming mythical Snyder's Swamp, Texas, as his home, Fast Richard spent most of his time charging across the pages of *Flying Models* during the late '60s and most of the '70s. Trend-setting high-thrust gas designs like the "Rambunctious," "Hysteria 1000," the "Texas Eagle" and A-2 gliders with fanciful names like the "Hypodemic Nerdle" and "American Crow" are part of his legacy.

In real life, which in Dick's case coalesced with his modeling life, he was at one time an assistant professor of Sociology at SMU, as I remember it, needing only his dissertation to complete his doctorate in the field.

Reviewing the effect that Dick has had on my association with the hobby, I joined reader Saxon in wondering at the present whereabouts of Fast Richard. I previously had occasion to visit him at his home in Lone Oak, Texas, around 1978, but had since lost track of him. Fueled by Reader Saxon's letter and my own curiosity, I picked up the phone and traced FR through his dad, Don, who still lives in Lone Oak. I'm happy to report that Dick is both alive and well, and working as a consultant in the Dallas area. Although he has been out of modeling for a number of years, his creative and puckish impact on the hobby will continue to be felt for a long time. I, like reader Saxon, miss him.

LARRY KRUSE
Liberal, KS

*We welcome your comments, opinions, and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News**, 632 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and length.*



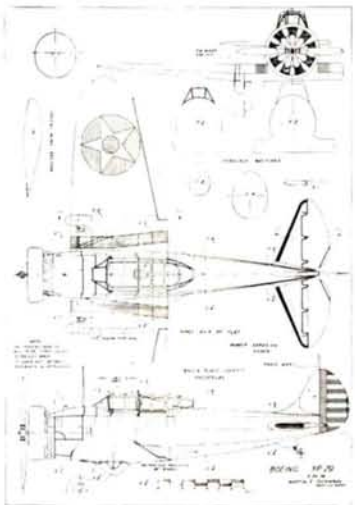
Fifty Years Ago

by DAN SANTICH

DECEMBER 1936 was a turning point in modeling history. The gasoline engine, while by now a proven method of propulsion for models, had been viewed with skepticism by many die-hard modelers who felt that it was only a fad, that it was dangerous and unreliable, and who were now flocking to their local hobby shops to look at, dream about, and perhaps even buy one of these marvels.

By far the most popular choice of gas engine was the Brown Jr. and the Baby Cyclone, although the Tlush, Bunch, and Forster Little Hercules were not that far behind. These were all spark-ignition engines and ran on a mixture of gas and oil. Kits were now abundant for these gas engines and some companies offered combination deals allowing you to buy an engine and get a kit for free. Popular kits for gas engines in 1936 were the California Chief, Scientific's Red Zephyr and Miss America, the G.H.Q. Sportster, Berkeley's Buccaneer and Cavalier, Modelcraft's Scout, International Models' Joe Ott-designed Rearwin Speedster, Jay's Model Shop's Denny Plane Jr., named after the famous screen star Reginald Denny, and Soper's Model Aircraft Company's the Privateer. Just about everything a young aviation enthusiast could want was there, and many a Christmas tree was laden with these gifts.

An engine that made its impact on the hobby was the Baby Cyclone.



Top: Scientific Model Airplane Company was one of the leaders in supplying kits, engines, and accessories. Bottom: The Boeing YP-29 was developed because of the Army's insistence on better performance from its fighter aircraft and featured a retractable undercarriage.

Joe Kovel was becoming famous with his KG-1, featured earlier in M.A.N.

The French Caudron Renault cleaned up at the 1936 National Air Races.

Coverage of the 1936 National Air Races at Mines Field, California, by Robert C. Morrison revealed a multitude of misfortunes. Jaqueline Cochran, Major de Seversky, Roscoe Turner, Frank Hawks, Steve Wittman, and many others all lost their airplanes in preparation for the race. The only fatality was L.C. Faulkner, who was killed in a parachute jump in front of the grandstand. The races were swept by the French-built Caudron-Renault at a speed of 301 mph.

Modeling and aviation were going through some big changes, and *Model Airplane News* was there, 50 years ago this month. ■

FUNDAMENTALS OF RADIO CONTROL

by CHARLIE KENNEY

THIS ARTICLE is about radios and, in particular, the types we use for model aircraft. They come in all varieties and price ranges and I'm sure it must be most confusing to fledgling RCers who may not have a local hobby shop or R/C club in their areas. I think a good place to start is with a block diagram to show the elements of a typical radio system for control of model aircraft (see Fig. 1).

Let's look at the block diagram starting with the transmitter, which is the heart of any radio system. Its function is to generate and control the radio signal format that is sent to the model aircraft. The number of control functions you need determines the number of channels the radio must have in both the transmitter and receiver. Typical radio systems that are commercially available are two-channel through eight-channel. So you see, there is a wide variety to choose from depending on your requirements. Needless to say, the more channels you need, the more expensive the radio set be-

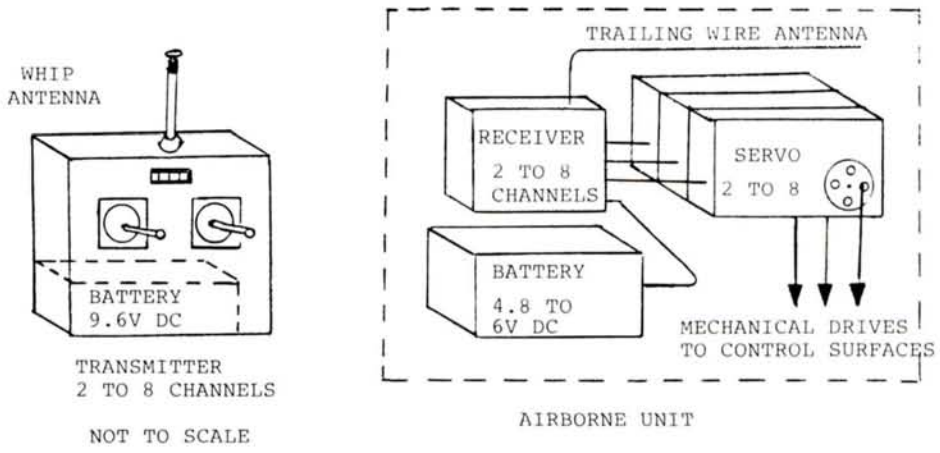


FIGURE 1

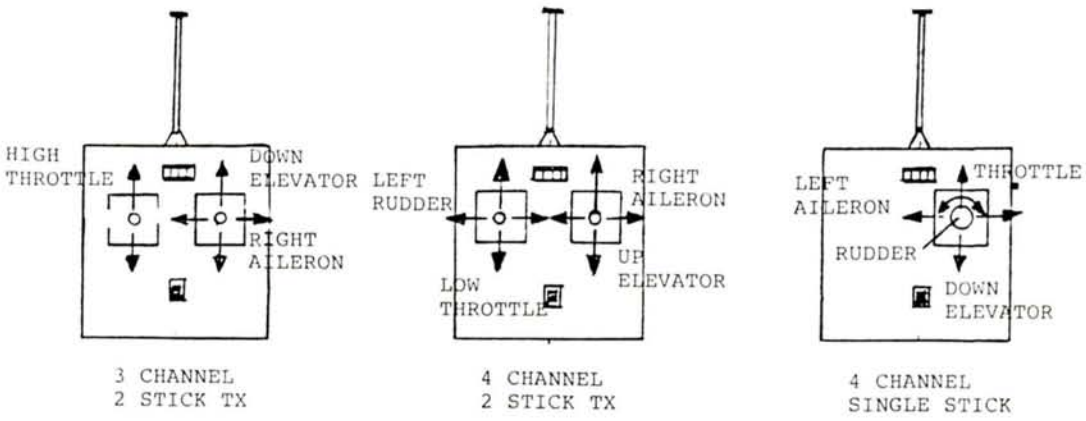


FIGURE 2

72 MHz BAND

Channel No.	Frequency MHz	Flag Color
12	72.030	brown/red
38	72.550	orange/gray
40	72.590	yellow/black
42	72.630	yellow/red
44	72.670	yellow/yellow
46	72.710	yellow/blue
48	72.750	yellow/gray
50	72.790	green/black
52	72.830	green/red
54	72.870	green/yellow
56	72.910	green/blue

27 MHz BAND

Frequency MHz	Flag Color
26.995	brown
27.045	red
27.095	orange
27.145	yellow
27.195	green
27.255	blue

FIGURE 3

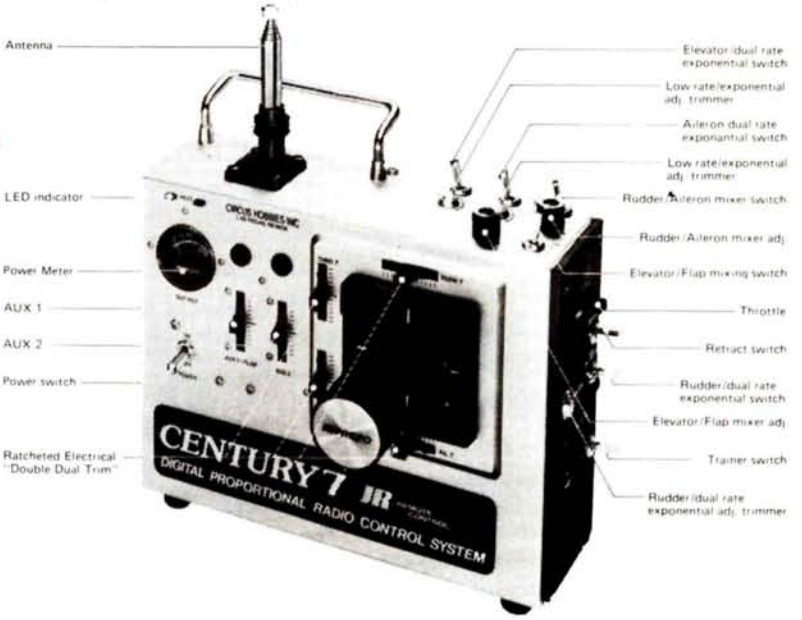
comes. In most cases when asked by a new R/Cer, I recommend a four-channel set for model aircraft. I started out with two channels for rudder and motor many years ago and it was very difficult to fly until the aircraft was trimmed properly. The addition of elevator helped a great deal and a fourth channel for aileron completed the system.

The transmitter sends or radiates the RF signal to the receiver by means of its antenna, a short multi-section telescoping whip antenna which measures about 50 inches long when extended and 6 to 8 inches when retracted.

This signal is received by the receiver, decoded, and sent to the servos where the electrical signals are converted into mechanical motion by the servo-mechanisms (servos for short). This mechanical motion is transmitted to the control surfaces and engine throttle by means of mechanical linkages such as a rigid push-rod. Now, as the radio uses proportional radio control and becomes channelized, the control surfaces (rudder, elevator, and aileron) and the engine controls can be moved to any position within the control extremes independent of one another or mixed. The amount of stick deflection and direction will directly correspond to a control surface action.

The power for the airborne receiver and servos is provided by an independent battery pack located in the model aircraft, as shown in Fig. 1. Transmitters come in a number of different configurations depending on number of channels and whether you wish to fly with two sticks or

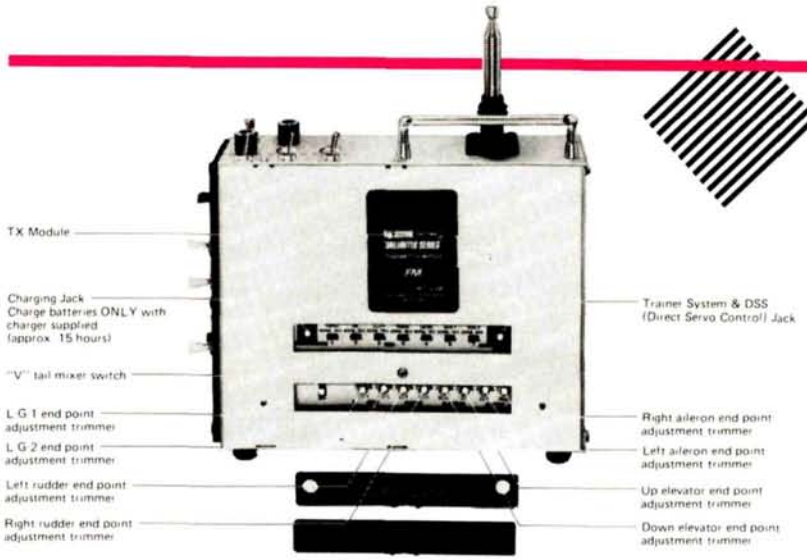
A study of the functions of the Circus JR Century 7 transmitter, below, will reveal accessibility to them while flying.



Futaba 3EGX Module system uses external knobs for exponential adjustments.

one. I've illustrated a two-stick/three-channel radio, a two-stick/four-channel radio, and a single-stick/four-channel radio in Fig. 2. The three-channel transmitter has its throttle on the left stick and moves between low-engine (back) and high-engine (forward) position by individual detented positions. Thus, the stick will stay in the position you place it

(Continued on page 106)



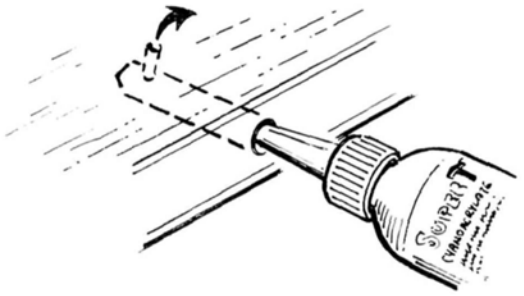
Left: Futaba G Series FP-T4NL is your basic setup. Above: Rear view of Century 7 JR single-stick shows removable panels for access to a myriad of control modification features.

photos by SUE KENNEY

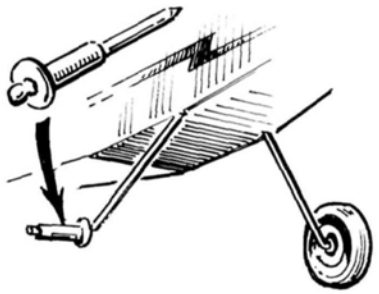
Hints & Kinks

by JIM NEWMAN

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o **Model Airplane News**, 632 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.



When fitting Robart Hinge Points, one first needs to drill a hole, then squirt glue into it. To ensure the glue goes all the way through, drill a 1/32-inch hole to intersect the larger one. When the glue comes out of the small hole, it has obviously gone all the way. ***Dennis Bryant, London, England***

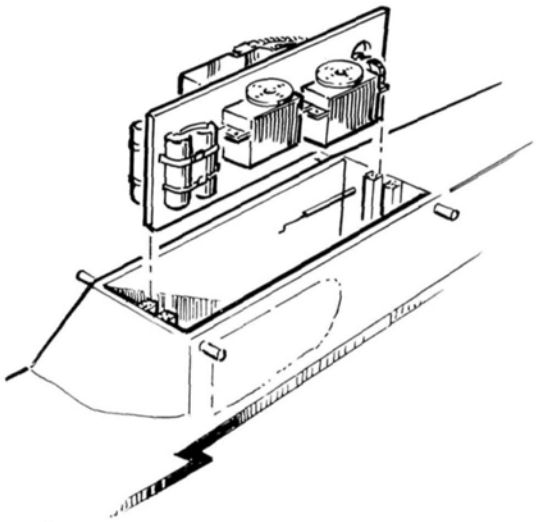


On ½A models, wheel collars on the inboard face of the landing gear look unsightly. Drive out the "nail" from a suitable size Pop rivet, then push it onto the axle. Now drill out the wheel to run on the axle, then retain it with a collar or a soldered washer. The rivet head now neatly stops the wheel from climbing the wire.

Jennings Holt, Jr., Loretto, Tennessee

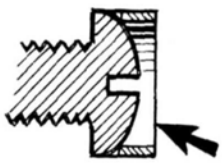
Feeling he lacked the skill to hand-paint a logo directly on the model, this contributor paints on decal paper. It's easier to scrap the paper than repaint the model if a mistake is made! Use any dope or enamel, then spray with clear urethane or epoxy to protect from fuel. Decal paper by Walthers, the model railroad people. Ask for No. 706820, diagram No. D682 in their catalog.

Tom Houle, Mequon, Wisconsin



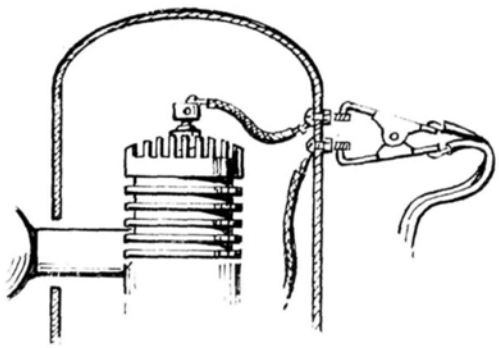
With only one radio between several models, a quick change system was needed. Servo tape mounts equipment and batteries on a plywood slide-in board. In most cases a sponge rubber pad under the wing will hold it in place or you can use Goldberg hatch fasteners.

Geir Leivseth, Bodo, Norway.



To prevent the screwdriver from slipping out of the slot, solder a ring of brass tube to the head of the screw. Obviously this only applies to the metal screws used on the larger models.

Richard Shirey, Sewickley, Pennsylvania



The deep cowl on this model prevents the use of a regular glowplug connector. Use the now-familiar wheel collar and wire, and bring a ground wire up from a mounting bolt. Solder both to a pair of bolts coming through the cowl, then clip as shown.

William Rauch, Hyattsville, Maryland

Out of the closet and into the limelight.

The Radio-Control BOOM!

by CHRIS CHIANELLI

NOT many years ago when I was in my early teens, it was just a dream to think of having total control of a plane, boat or car model at that day's prices. Today, a good two-channel radio is obtainable for under fifty bucks—and I've seen four-channel airplane starter radios with two servos for under seventy dollars! But price alone is not the reason that R/C models have established themselves as everyday diversions in the average household.

In the past, radio gear was used solely by the very dedicated and skilled modeler squirreled away in the basement, lost in the wonderful weaving of balsa and silk. Being one such squirrel, I still find great satisfaction in seeing a project come to its fruition rendering a unique creation, yet I also find the latest trends encouraging rather than the least bit threatening. With the advent of almost-ready-to-go cars, boats, and planes, and with the availability of dependable and affordable radios, the hobby has burst through the closet door landing itself in the hands of those with only nominal building skills. The R/C phenomenon is simply growing out of control. When you begin to see Saturday prime-time TV ads in between cartoons and Kung-Fu shows, you get the feeling something's up. Without getting political, but perhaps a little, the more that R/Cers—car boat or plane modelers—are viewed as a single voting entity, the better. This growth should be viewed as a very positive thing. After all, the radio control world shouldn't be reserved for only those with more spare time or modeling acumen.

The modern radio is not only a bargain when compared with prices of eight or 10 years ago, but the reliability from Ni-Cds to servos has greatly increased. I wouldn't go so far as to say today's sets are maintenance-free, but they're darn close to it. Such tasks as cleaning and treating the pots with a conductive lubricant seem to be relatively unnecessary these days. Of course, like anything else, isolated problems will always crop up, but by and large, the modern radio causes amazingly few headaches. At least that's been my own experience. And just for the record—I'd like to see more parts available for the modeler, as they were in the past, simply because some not only prefer to make their own repairs, but actually enjoy this aspect of the hobby. Replacing servo gears, for example, is a relatively easy job and you don't need to wait for turnaround repair service. On the other hand, most feel more at ease letting qualified service personnel do the honors when it comes to that

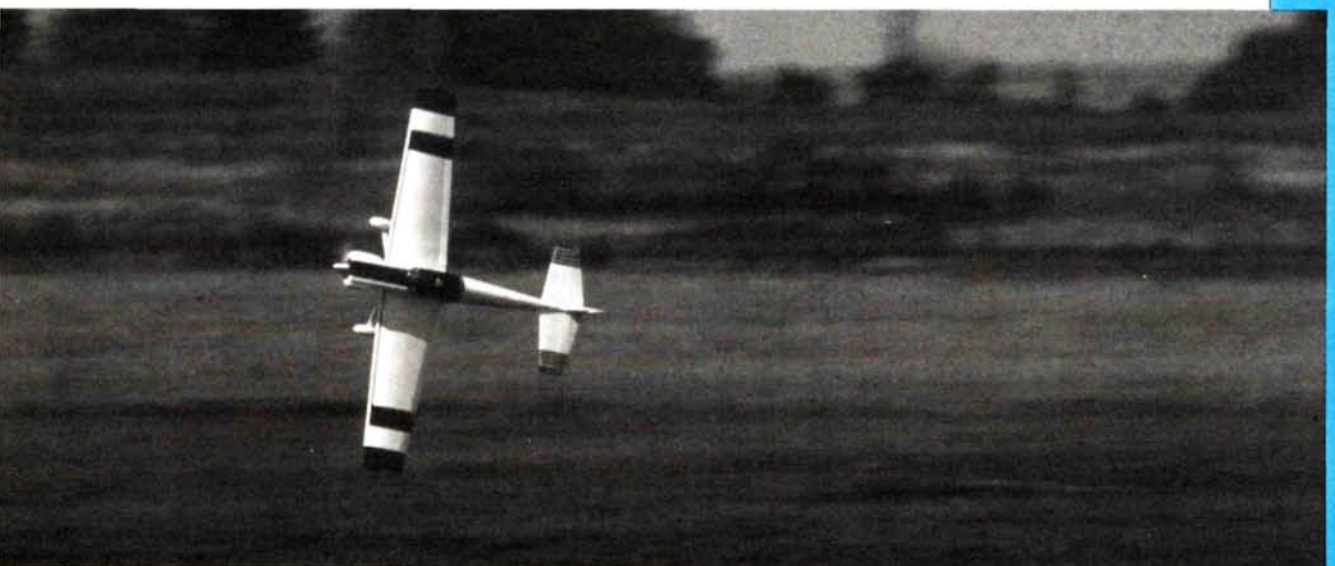
complex device, the radio, that holds the life of our beloved creations in the palm of its plastic grip. I feel the option should still be offered for the do-it-yourselfer. But in view of the tremendous technological advances that have brought us to where we are now, this does seem like a rather picky complaint.

Modelers, like anyone else, tend to take things for granted. For those of you new to R/C and for those of you with selective memories, let's recall the good old days of the *dubious* radio. I remember well, and I'm not that old, the days when a great day of flying was attributed to having your radio perform for a full day in the field without a hitch or glitch. Don't get me wrong, I think back on those days with great fondness because the challenge, though different, was there. Back then, part of the reward was to have and keep a radio working: you accepted that if you wanted to participate.

Today, the *reliable* radio allows you to shift more of your attention to what I believe is the more fun-filled part of the hobby—running, or flying, your radio-controlled car boat or plane! ■

Below: Wild Aeromarine R/C Chris Cat powered by twin .65s. R/C boat racing is experiencing a lot of growth.

Unstoppable MRC 4WD R/C Bruiser. Recent R/C car explosion has greatly accelerated product development and technology. Diversity of available electric and gas cars is awesome. Below: A Great Planes CAP 21 in perfect knife-edge form.



Four-Cycle Forum

by ELOY MAREZ

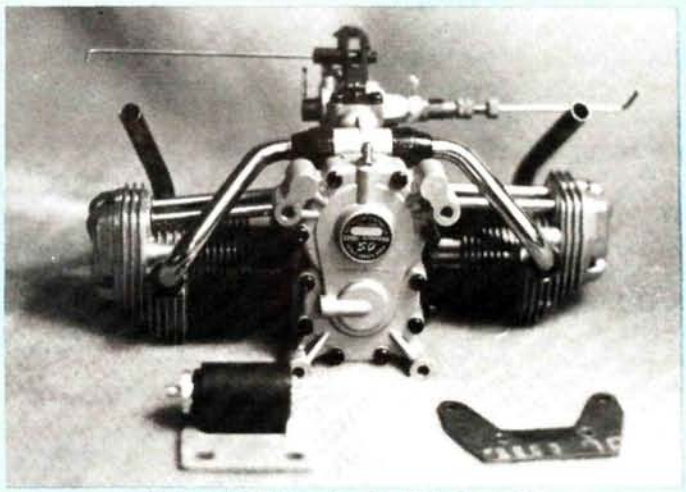
I'VE MENTIONED fuel problems here before. Regular readers will remember that in previous discussions about troubleshooting four-stroke engines I've always advised that you should first confirm the basics (is it getting fuel and fire at the right time and in the right proportions?) before you go looking for any exotic imaginary problems. This month's opening letter from Bill Skipper of Greeley, Colorado, deals with that subject. Bill's letter was sparked by Dan Santich's excellent article entitled "Basic Fuel Systems" in the July 1986 *M.A.N.* Bill writes:

"As you pointed out, R/C (or C/L) fuel systems seem to be the most taken-for-granted and least suspect equipment going. I can't tell you the number of times I've been called on to troubleshoot a buddy's problem and have traced it to the fuel system. Most of the time attrition and carelessness are the predominant factors.

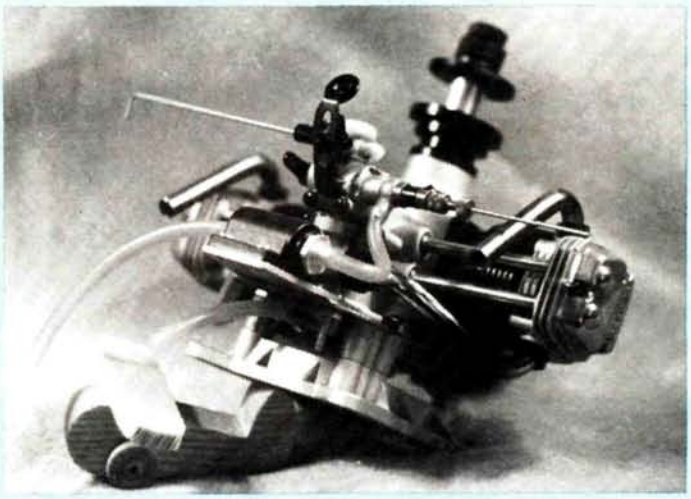
"After indulging in practically every aspect of modeling over the years, I've at least settled with R/C, .60 size and up, and am now getting into four-strokes with enthusiasm. Though they are still in their design infancy, they have come a long way since 1975. Many of the earlier problems have been licked, but there remains one that only a good fuel pump will alleviate. In the enclosed photos is the method I have adpated for use of the Perry* Micro-Oscillating fuel pump on the O.S. Gemini 160 FT. It works extremely well and crowds nothing.

"I made the adapter plate from 4130 chrome molybdenum aircraft sheet steel, .063 thick, but it could easily be made from .090 Alclad. The use of such a pump provides great peace-of-mind with finicky four-strokes."

Bill's photos are pretty much self-explanatory. The basic idea is good and should apply equally well to many other engines. The only things that need to be changed are the shape and dimensions of the mounting plate. If you live in a large metropolitan area, you won't have any trouble locating a source of usable material, but for those of you who have to depend on the mail for some of your supplies, you can obtain sheet aluminum in small quantities from Small Parts, Inc.* This company sells numerous hardware items, including .063 and .125 aluminum in 3x6-inch sizes. That size should yield a couple of pump-mounting plates, but if your needs are greater than that, the same, plus other thicknesses of a similar material, is available in up to 12x24-inch sizes.



To help fuel draw for the O.S. Gemini, the Perry Oscillating pump is useful.



Mounting bracket for pump attaches directly to engine.

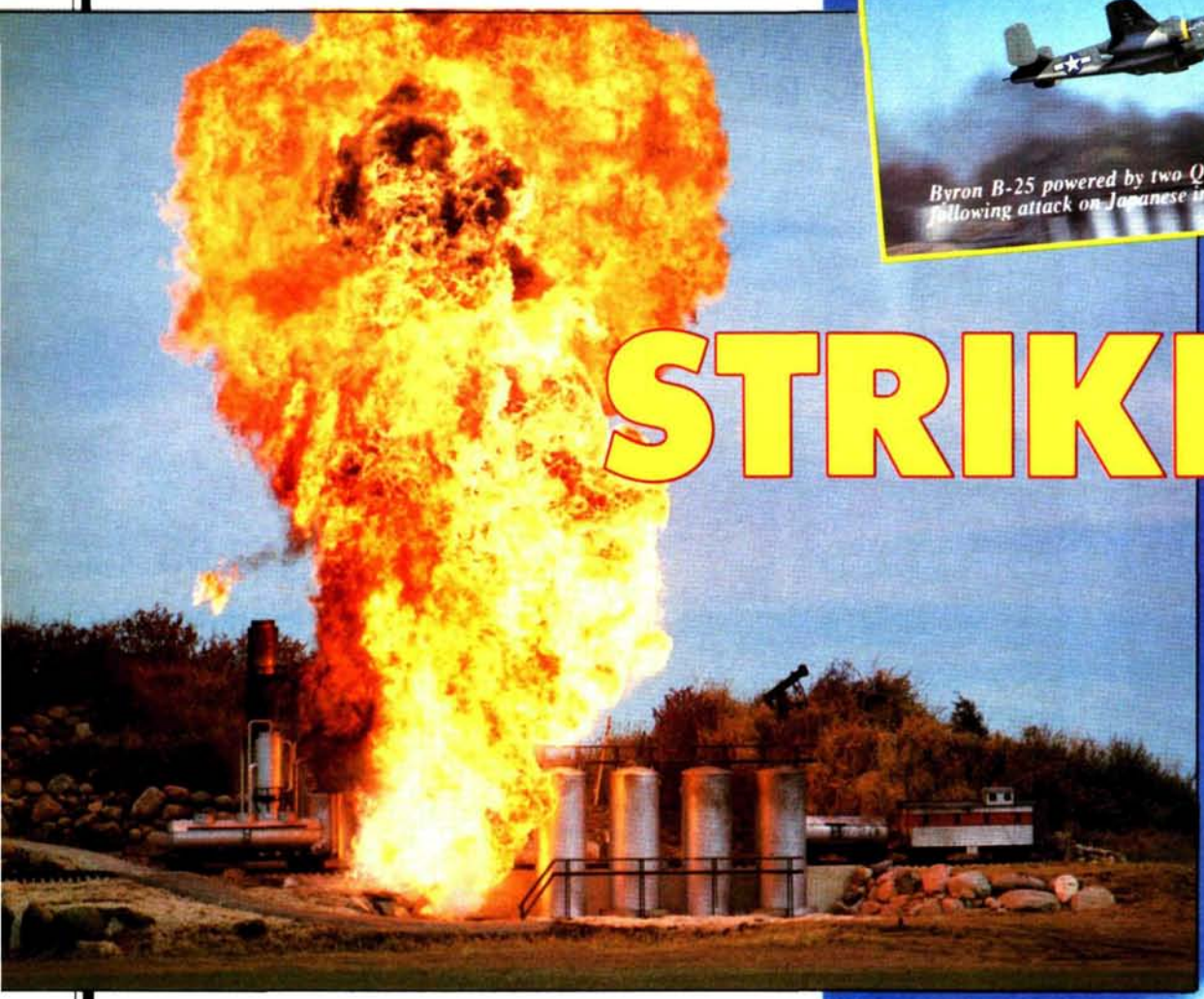
Fuel filters are fuel system items that haven't been mentioned here, but are probably worth talking about. They can be the cause of some rather baffling engine problems. My advice is not to use them! Sacrilege, right? More about that later.

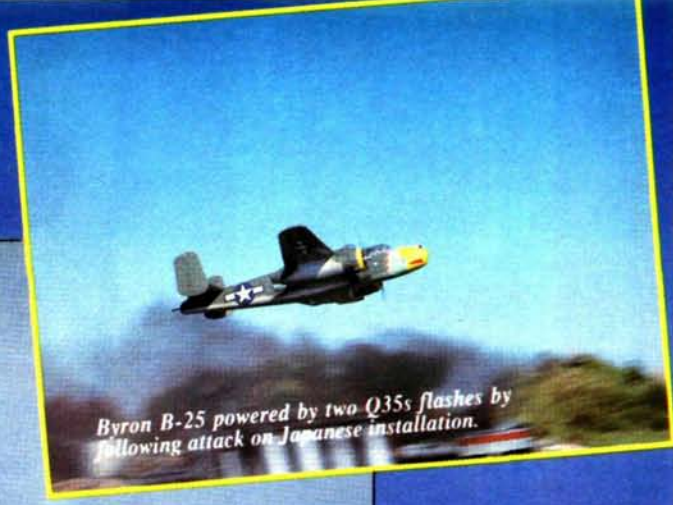
The first indicators that a fuel filter is

(Continued on page 116)

by ART SCHROEDER

Byron Originals





Byron B-25 powered by two Q35s flashes by following attack on Japanese installation.

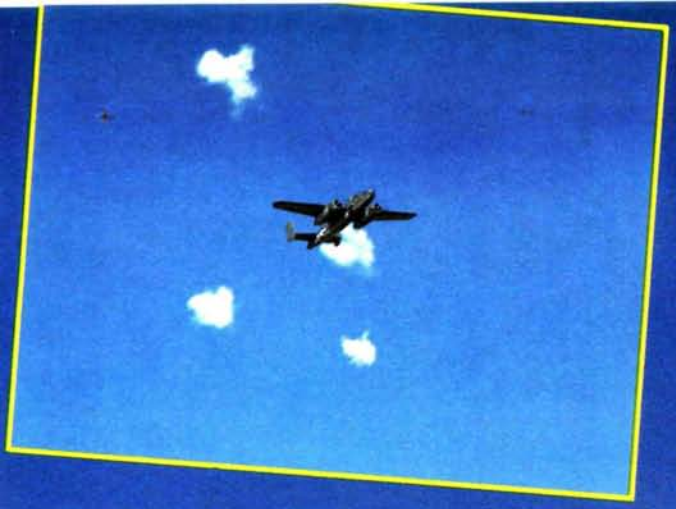
STRIKING

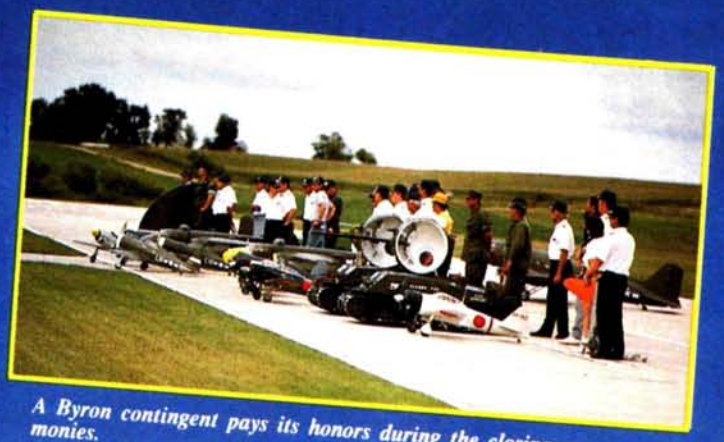
Somewhere in the South Pacific (MAN report) —It was learned early today that Colonel G and his ⅕-Airforce has finally shut down a Japanese air, rail and refining installation that has been plaguing this theater of operations for three years. Attack was in full-strength with Mitchell B-25s, Thunderbolts, Corsairs and Mustangs.

After three days of intense activity, by 1700 hours (5 pm) Sunday, the Japanese base was a devastated, smoldering wasteland. In the action's early phases, a superior force of zeros appeared to have the upper hand. But with Colonel G's tactical genius and his group's uncanny piloting skill the zero force was null by day's end—kill ratio, at least 8 to 1.

Prior to the action, all reporters gathered at the American I.G. base had heard rumors of a new superbomber that would have intensified this latest effort to eliminate the Japanese airfield. Indeed, feverish activity at one hangar indicated that the bomber would fly before this latest push was over.

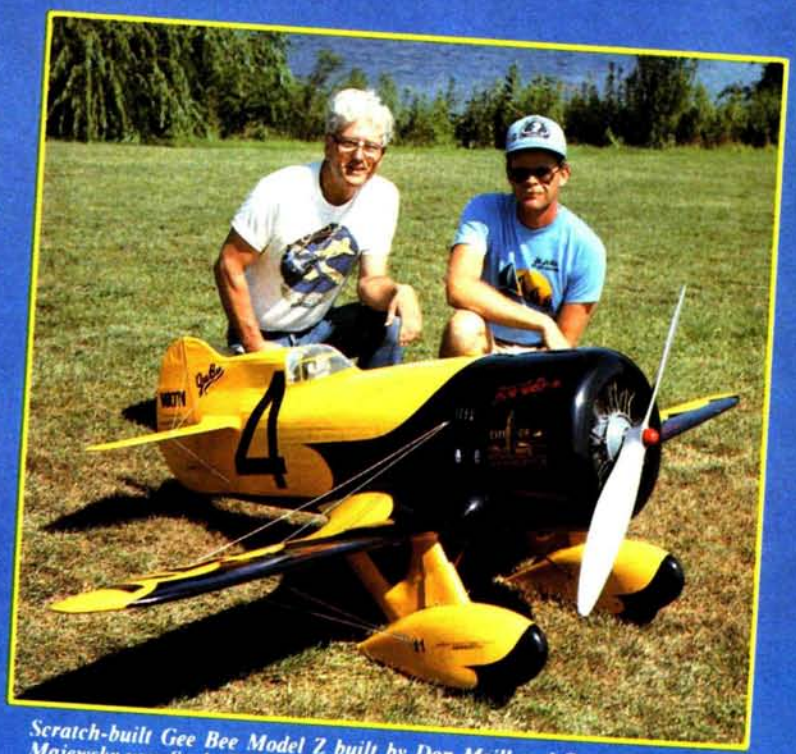
Gorgeous Northrop A-17 by Bud Atkinson spans 72 inches, weighs 23 pounds, and uses a Zenoah G-38.





A Byron contingent pays its honors during the closing ceremonies.

BACK AGAIN!



Scratch-built Gee Bee Model Z built by Don Meill and flown by Terry Majewsky uses Sachs 3.7 for power and weighs 32 pounds.

Remarkable workmanship was found in Bob Huisinga's Fairchild F-24W. Wingspan is 109 inches, weight is 28 pounds, power is Q50.

Walt Moucha tore up the sky with his Q-82-powered Citabria Pro. Model has a 10-foot span, weighs 35 pounds, is scratch-built, and is painted with acrylic lacquer.

Much like General McArthur in WW II, Byron Godberson, effectively directed the total destruction and surrender of his enemy.

The finale to the WW II reenactment was the annihilation of the enemy airbase and fuel refining depot.

While that did not happen, all priveleged to see the new warbird were sure that any further aggressive enemy action would be quickly stabilized by its block-busting abilities when it did fly.

Colonel G, in retrospection, praised the efforts of his pilots, mechanics and support staff. And well that he did, for they'd carried the day. It was one more step on the road to the goal we seek. "Striking Back" was a proven strategy!

It may be that, some day, I'll become used to the annual show that I attend in Ida Grove, Iowa. Indeed, the day may come when I become jaded at the Byron Originals' exhibition. But I doubt it!

After all, where can one who loves flying things go and see 300-plus modelers doing their thing with beautiful giant-scale birds of every description; where no one can see the Christen Eagles put on their aerial ballet, where sky divers rain from the sky, where manufacturers are available at booths showing model aviation's latest goodies, where symposiums are held on all kinds of R/C subjects for those who wish to learn, where great pizza is available for those who wish to eat, where America's finest model-flying facility beckons, and where Byron Originals stages its fantastic "Striking Back" presentation. Ida Grove surely is modeling's Disneyland!

Disneyland is the only thing that compares with the Byron presentation.

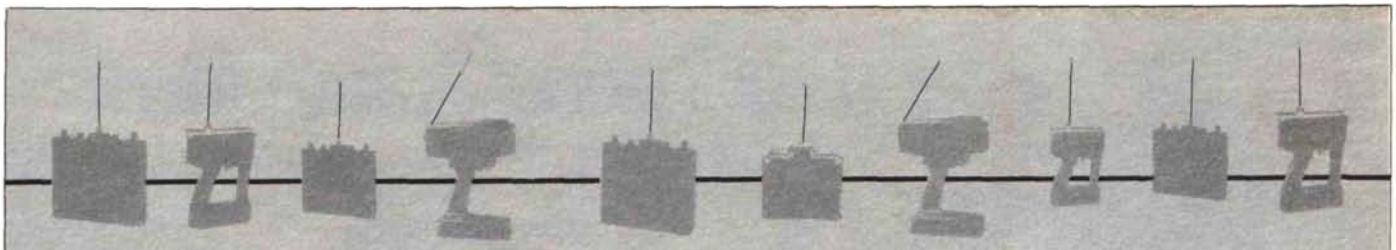
Anyone who's ever visited the California or Florida Disneyland will be struck by the quality and attention to detail that has made them so incredibly successful. I had the same feeling in Ida Grove—detail, superb timing, scale accuracy, realism, logical script all lead up to a grand climax while enhancing sound effects and dynamic visuals. To borrow a Disney term, it is "aeronautic audioanimatronics!" The difference is that all is done with 1/5-scale model airplanes flown in an apparently free environment.

It all came together to present a true visual picture of a WW II air battle where one could feel the heat, noise and searing quality of the violence that must have been unleashed in the real battles. Truly, Disney himself would be proud of this show. Certainly, the Byron Originals' group is proud of it, a show that brings model aviation to a new level of maturity.

In any event, this show drew modelers from all over America, and some from foreign lands, in great numbers. I have no idea how many flights were flown; I'm sure, though, that no one left with the feeling they'd not had enough flying opportunities.

Flying started in the early morning and ran to about 3:00

(Continued on page 76)



Radio Control Transmitter Consumer Guide

by DAN SANTICH

TODAY'S RADIO-CONTROL systems are a marvel of technology and engineering, but things were not always so. It used to be said that you were blessed if you had a radio that worked. I suppose that still applies; however, the chances of getting a bad radio, or one that gives you fits every time you fly, are slim today. But it does happen, even with the best.

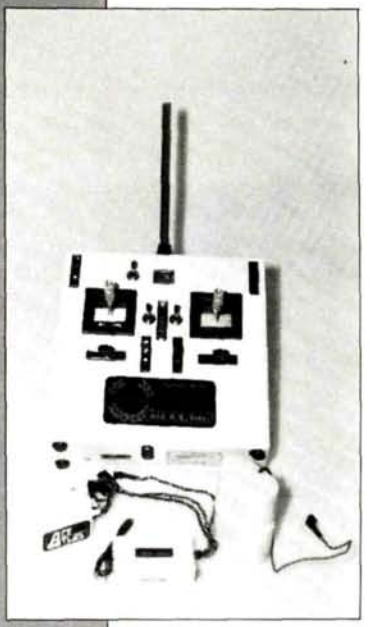
Speaking of best, the obvious question is which one should you buy. That's a good question. The answer is to buy the radio that ***suits your needs.*** *If you fly sailplanes only and never intend to go to powered aircraft, a two- or three-channel set will do. If you have a limited budget or are just learning, a two- or three-channel set might do, but remember the future. A three-channel radio limits you to three functions, i.e., elevator, rudder, and throttle. Of course these can be switched to elevator, aileron, and throttle, or any combination thereof, but you'll still always have only three functions. Two- and three-channel sets are usually the least expensive, yet the quality is on a par with the multi-function sets. They all work the same, the only difference is in the number of functions and capabilities, such as dual rate, servo mixing, servo reversing, programmable functions, etc.*

Right now there's a lot of worrisome talk about adjacent-channel R/C interference, second order intermodulation, third order intermodulation, image frequency interference, AM versus FM, and 1991 standards.

The best advice I can give is to follow the crowd. This might seem simple-minded in theory, but in practice will save you much hassle and money. Read everything you can about radios, such as "Control Tower" by Charlie Kenney, and listen to the guys at the flying field, but don't take their advice to the bank. Get a second opinion, and a third. Whatever your decision, chances are better than 99% that you'll get a radio that will give you many hours of flying enjoyment, and ***that's*** *what the hobby is all about.*

The radio systems presented here do not include all that are available, but rather a sample of most. For more information concerning any of them, or for a complete list of available products, please write to the manufacturer or distributor.

7- and 8-Channel Transmitters



Ace Silver Seven

ACE R/C (116 W. 19th St., P.O. Box 511C, Higginsville, MO 64037) has long been recognized for excellent radio kits and associated electronic hardware. In addition to offering kits you can build, they also have factory-assembled-and-tested units.

The Silver Seven is Ace's latest radio-control unit, and fulfills all 1991 requirements. Four different versions of transmitters are available, depending on stick preference and configuration. The receiver is lightweight and uses a shielded, double-tuned front end for excellent consistency, resistance to intermodulation, plus a low parts count for reliability. The servos provided are the Atlas High Output type and rely on the Signetics NE 544 IC, a component developed specifically for use in the Ace servos. Included with the Silver Seven are the transmitter, receiver, four servos, receiver Ni-Cd, charger, and assorted hardware.

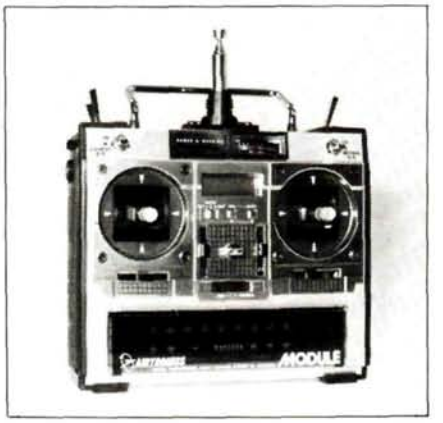
Transmitter Type: *Two-stick digital proportional*
Weight: *33 ounces*
Power Output: *600 MW*
Frequencies: *72 MHz*
Modulation: *AM Pulse Position 96%*
Servos: *Atlas*
Power Supply: *Ni-Cd*

Airtronics CS7P/CS7PS/CS7HS/CS6H

THE DUAL-STICK CS7P is the most versatile of the Airtronics (11 Autry, Irvine, CA 92718) Championship Series radios and incorporates many of the features found on more expensive R/C systems. The CS7PS is a single-stick version that retains all the features of the CS7P. The CS6H helicopter transmitter features all the unique functions required for optimum control of rotary winged aircraft. The CS7HS is a 7-channel stick version of the CS6H.

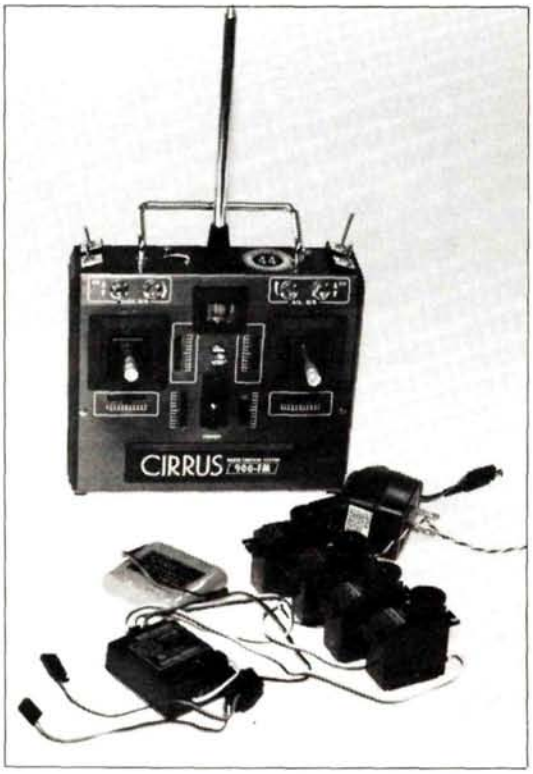
Transmitter Type: *7-channel single- and dual-stick*
Weight: *34 ounces*
Power Output: *700 Mw*
Frequencies: *53 and 72 MHz*
Modulation: *AM and FM*
Servo Choices: *94631, 94551, 94554, 94510*
Power Supply: *Ni-Cd*

Transmitter Type: *7-channel digital proportional*
Weight: *37 ounces*
Power Output: *500 Mw*
Frequencies: *50, 53, and 72 MHz*
Modulation: *FM*
Servo Choices: *94551, 94554, 94631*
Power Supply: *Ni-Cd*
Receiver Type: *Dual conversion*



Airtronics 7P (Module)

AIRTRONICS (11 Autry, Irvine, CA 92718) Module 7P system is designed for all standard equipped fixed-wing power aircraft. This versatile radio offers a wide range of features suitable for competition fliers, sport pilots, and ¼-scale enthusiasts. It offers solid power without extra mixing and coupling features, except flaps, has high throttle travel adjustment, and a Snap Roll button.



Cirrus 900-FM 7-Channel

THIS DELUXE radio from Hobby Shack (18480 Bandilier Circle, Fountain Valley, CA 92728) offers most of the whistles and bells of sets costing more than twice the price. Housed in a metal case, the transmitter is neatly arranged without a lot of confusion. There are three dual-rate functions: elevator, aileron, and rudder. The auxiliary channels are actuated by conveniently located toggle switches and trim levers to avoid confusion while flying. Also included are two mixers for flaperons, flapevators, or rudder-aileron coupling, as well as a trainer plug and buddy switch. Servo-reversing switches are conveniently located under the front panel and provide six servo-reversing functions.

The receiver used with the 900-FM is the HS-974-FM 7-channel, triple-tuned unit that uses a gold-plated mini block connector for added reliability, as well as a J-FET front end with double balance mixer and narrow band IF filtering. Included with each set are four CS-128 high output servos that use IC boards, sealed potentiometers, precision resin gears, and triple-segment wiper contacts for optimum reliability.

Transmitter Type: *Two-stick digital proportional*
Weight: *33 ounces*
Power Output: *400 Mw nominal*
Frequencies: *72 MHz*
Modulation: *FM*
Servos: *CS-128*
Power Supply: *Ni-Cd*

Futaba FP-8SGH-P Helicopter System

THE FUTABA (555 W. Victoria, Compton, CA 90220) 8SGH-P system is controlled by the T8SGH-P transmitter with pitch to rudder/throttle to pitch control mixing, throttle-hold control, acceleration mixing, pitch trim, hovering memory, and much more.

Transmitter Type: *Two-stick digital proportional*
Weight: *22 ounces*
Power Output: *500 Mw*
Frequencies: *72 and 75 MHz*
Modulation: *FM PCM*
Servos: *S130 ball bearing*
Power Supply: *Ni-Cd*

JR PCM 9 Single-Stick

THIS RADIO from Circus Hobbies (3132 S. Highland Dr., Las Vegas, NV 89109) is for the modeler who wants it all. The single-stick transmitter has every conceivable function you could ask for, such as ratcheted electrical double trims, servo-reversing on all 9 channels, end-point adjustments on 8 channels, dual-rate and exponential, double dual-rate for ailerons, differential, one-touch fail-safe, and much more. The helicopter version offers the above, plus anti-torque tail-rotor mixing, four separate collective pitch control systems, two high-idle and throttle-hold systems, and inverted flight systems.

Transmitter Type: *9-channel digital proportional single-stick*
Weight: *48 ounces*
Power Output: *600 Mw*
Frequencies: *72 and 53 MHz*
Modulation: *ABC & W Dual*
Servos: *JR 4001 (four)*
Receiver Type: *Dual conversion (exceeds 1991 standards)*

Multiplex Royal MC Softmodul Microcomputer, PCM-PPM System

Transmitter Type: *7-channel digital proportional*
Weight: *46 ounces*
Power Output: *1.5 watts*
Frequencies: *50, 53, and 72 MHz*
Modulation: *FM*
Power Supply: *Ni-Cd*
Receiver Type: *Dual Conversion PCM-PPM*
Servos: *Optional*
Modules: *Optional*

THE ROYAL MC is made in West Germany and is sold exclusively in the U.S. by Beemer R/C West (7725 E. Redfield, Ste. 105, Scottsdale Airpark, Scottsdale, AZ 85260). Coming in three different variants, Expert, Intermediate, and Basic, each system can be tailored to the customer's requirements. This saves you money, since you don't have to buy things you don't need. The basic system is comprised of the transmitter and receiver in each of the variants. Once your basic system is decided upon, you have no less than 9 different servos, 5 batteries, and 23 modules to pick from.

The Royal MC transmitter is a 14-function expandable system of PCM-PPM operation and is powered by a 7.2-volt 500-mA battery. The receiver is a narrow band, dual conversion, 7-channel unit that operates from a 4.8-volt 1,200-mA flight battery. Also included with the basic system are the transmitter and receiver charge cables, flight switch harness with built-in charge jack, and a seven-outlet 110-volt charger.

Simprop PCM System

MADE IN West Germany and marketed by Altech Marketing (P.O. Box 286, Fords, NJ 08863), the Simprop family of electronic products has been around for a long time, and the SAM PCM 20 is an example of Simprop's excellent reputation for fine radio systems.

Fully modular in design, the PCM 20 is one of the few radios to offer a fail-safe mode in the case of interference. It is programmable for control mixing, and has no less than 10 channels of operation. Plug-in encoder boards give you the versatility to convert the system at will.

The basic system includes transmitter, receiver, one servo, and a Ni-Cd battery. The receiver is of dual-conversion circuitry and is 1991 qualified. The choice of servos ranges from the tiny C servo that weighs but 2 ounces to the power servo that puts out 208 inch-ounces of torque.

Transmitter Type: *10-channel digital proportional*
Weight: *2.9 pounds*
Power Output: *295 Mw*
Frequencies: *72 MHz*
Modulation: *FM/PCM*
Power Supply: *Ni-Cd*
Receiver Type: *Dual conversion*
Servos: *Optional*

World Engines Expert FM Dual Conversion

Transmitter Type: *Two-stick digital proportional*
Weight: *34 ounces*
Power Output: *500 Mw*
Frequencies: *72 MHz*
Modulation: *FM*
Servos: *S-25*
Power Supply: *Ni-Cd*
Receiver Type: *Dual conversion*

THE WORLD ENGINES (8960 Rossash Ave., Cincinnati, OH 45236) Expert Series radios are offered in 7- and 4-channel versions. They offer complete versatility and adaptability to your choice of model application. The transmitter is housed in a deluxe body specially designed for greater operability, smoothly operating sticks, and the function modules system dreamed about by airplane enthusiasts. The dual sticks are adjustable for tension and length and are smooth operating. The antenna is a ten-stage unit that permits high signal radiation and the system also allows frequency changes at the field. The receiver uses an ultra-narrow band ceramic filter that allows simultaneous flights at a 10 kHz separation. The system includes four S-25 IC servos with an output of 35 inch-ounces of torque. The World Expert FM exceeds 1991 standards.

4- to 6-Channel Transmitters

Ace R/C Olympic V

THE ACE R/C (116 W. 19th St., P.O. Box 511C, Higginsville, MO 64037) Olympic V is a 5-channel radio designed to provide a solid, dependable system that will give years of trouble-free operation for either the newcomer to R/C, the sport flier, or the serious competitor. The system is provided less servos so you can pick the number, size, and price tag you wish, depending upon your desired application. Included with the basic system are the transmitter, receiver, airborne battery, switch harness, and charger.

Transmitter Type: *Two-stick digital proportional*
Weight: *23 ounces*
Power Output: *600 Mw*
Frequencies: *72 MHz*
Modulation: *AM*
Power Supply: *Ni-Cd*

Acoms

Transmitter Type: *Two-stick digital proportional*
Weight: *28 ounces*
Power Output: *500 Mw*
Frequencies: *72 MHz*
Modulation: *FM*
Servos: *AS-8/9*
Power Supply: *Ni-Cd*

ACOMS Digital Proportional radio control systems are marketed by Altech Marketing (P.O. Box 286, Fords, NJ 08863) and offer the modeler an inexpensive route to modeling enjoyment. The AP-472 is a 4-channel FM set that provides the basic ingredients for modeling fun. Included with the system are three AS-8 servos, an AS-9 reverse direction servo, a 500-mAh battery, a Ni-Cd charger, servo tray, switch harness, and frequency flag. The systems feature servo reversing and dual rates on some versions.

Airtronics SR 6DR and SR 4

THE ECONOMICAL Airtronics (11 Autry, Irvine, CA 92718) SR Series radio systems are designed for value-conscious modelers who want the best features, appearance, and reliability for their radio dollar. The same state-of-the-art circuitry and modern construction techniques used in their more sophisticated and expensive systems combined with the basic features of the SR design provide a dependable R/C system that meets the need of the first-time hobbyist, as well as the more experienced modeler. The SR series radios give the modeler the convenience and flexibility of servo reversing, which makes the equipment installation a lot easier.

Transmitter Type: *Dual-stick 4- and 6-channel*
Weight: *31 ounces*
Power Output: *700 Mw*
Frequencies: *72/75 MHz (SR 4); 72 MHz (SR 6DR)*
Modulation: *AM or FM*
Servos: *94631*
Power Supply: *Ni-Cd*
Receiver Type: *Balanced mixer AM or FM*

Aristo-Craft Hitec Challenger 4000

THE CHALLENGER 4000 from Polk's Model Craft Hobbies (346 Bergen Ave., Dept. 20A, Jersey City, NJ 07304) is a low-priced 4-channel system that offers unique adaptability and reliability. A dual-stick, dual-axis gimbal assembly that is adjustable in tension and length, the transmitter uses either dry cells or Ni-Cd batteries. The receiver is of narrow-band design and uses ceramic filtering for resistance of adjacent-channel interference, plus the option of interchangeable crystals. The system comes with two HS-402 water-resistant servos with a torque output of 42 inch-ounces.

Transmitter Type: *4-channel, two-stick*
Weight: *20 ounces with batteries*
Frequencies: *27, 72, and 75 MHz*
Modulation: *AM*
Servos: *HS-402 (two supplied)*
Power Output: *500 Mw*
Power Supply: *Ni-Cd or dry cell*

Aristo-Craft Hitec Challenger 420/720

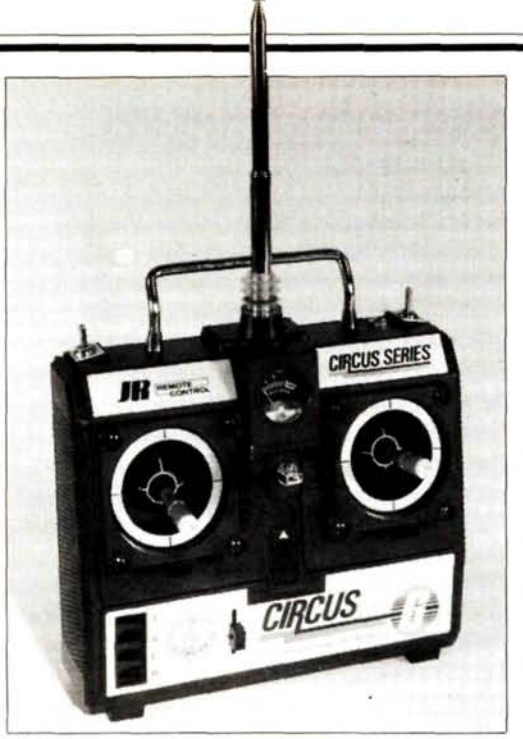
THE CHALLENGER radio system from Polk's Model Craft Hobbies (346 Bergen Ave., Dept. 20A, Jersey City, NJ 07304) offers 4- and 7-channel sets that are versatile, reliable, and reasonably priced. Employing the latest technological developments, this is an all-solid-state radio with modern circuit design. The transmitter offers adjustable control sticks, multiple control-mixing functions, dual-rate control for 2 channels, servo-reversing switches, electronic trim adjustments, and a choice of battery uses.

Transmitter Type: *Dual-stick*
Weight: *22 ounces with batteries*
Frequencies: *72 MHz*
Modulation: *FM*
Power Output: *500 Mw*
Power Supply: *Ni-Cd or dry cell*
Servos: *HS-402 (three supplied)*

Cannon

THE CANNON R/C (13400-29 Saticoy St., No. Hollywood, CA 91605) System offers 1991 features at a competitive price. The receiver is narrow-band and uses Model 914 subminiature servos, which provide high power and low weight. The Model 910T transmitter is a high power unit which has "Soft Touch" sticks, full Ni-Cds, IC encoding circuitry, and servo reversing.

Transmitter Type: *2, 3, or 4 channels*
Weight: *16 ounces*
Frequencies: *27, 72, 75 MHz*
Power Output: *750 Mw*
Power Supply: *Ni-Cd or dry cell*
Modulation: *AM*
Servos: *Optional*



Circus 6

THE CIRCUS 6 radio from Circus Hobbies (3132 S. Highland Dr., Las Vegas, NV 89109) is a 6-channel set that offers versatility and reliability to the sport modeler as well as the serious competitor. Housed in a distinctive, attractive case, the transmitter layout is functional and comfortable. Trim levers are within easy reach without contact from the sticks, and servo-reversing switches are conveniently located on the front of the transmitter. This set is also available in a helicopter version with mixing for throttle/collective and A.T.S. anti-torque systems.

Transmitter Type: *Dual-stick digital proportional*
Weight: *29 ounces*
Power Output: *500 Mw*
Frequencies: *72 MHz*
Modulation: *AM*
Servos: *JR 505 (four)*
Power Supply: *Ni-Cd*

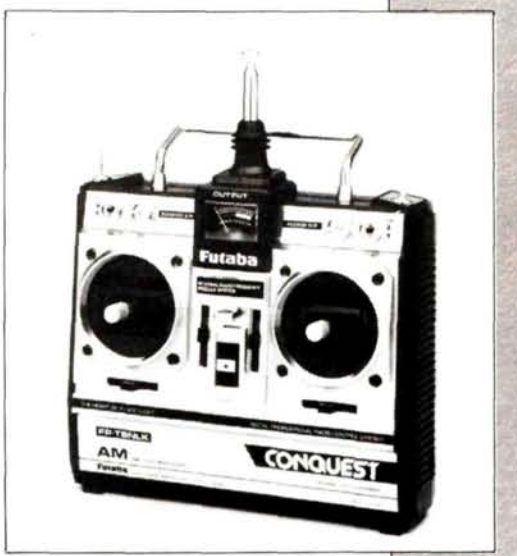
Futaba Conquest 4NL/4

ENTRY-LEVEL fliers can look to Futaba (555 W. Victoria, Compton, CA 90220) for another great system, the Conquest 4NL, Futaba's lowest priced 4-channel system. The transmitter uses the G-series precision adjustable gimbals for precise control, 4-function servo reversing, electronic trim adjustments, and much more.

Transmitter Type: *Two-stick digital proportional*
Weight: *14 ounces*
Power Output: *500 Mw*
Frequencies: *72 and 75 MHz*
Modulation: *AM*
Servos: *S-28 servos (three)*
Power Supply: *Ni-Cd*

Futaba Conquest 6NLK/Dual Rate

FOR THE sport flier looking for value, Futaba (555 W. Victoria, Compton, CA 90220) introduces the new 6-channel, dual-rate Conquest 6NLK. Easily mistaken as much more expensive, this set has precision-adjustable gimbals, dual rates, modular RF board, servo reversing, and much more.



Transmitter Type: *Two-stick digital proportional*
Weight: *20 ounces*
Power Output: *500 Mw*
Frequencies: *72 and 75 MHz*
Modulation: *AM*
Servos: *S-28 (four)*
Power Supply: *Ni-Cd*

Tower Hobbies System 500

THE TOWER Hobbies (P.O. Box 778, Champaign, IL 61820) System 500 is the fifth in a generation of fine radios sold by Tower and has many of the features found on sets costing much more. The transmitter is housed in aluminum for minimal static induction, and is lightweight and comfortable, even in the smaller hands of youngsters flying their first model. Incorporated with the transmitter are dual-rate switches for elevator and ailerons, a trainer switch, and auxiliary switches for flaps and retracts. A plug-in crystal receptacle is also located on the front of the transmitter for convenient access. The receiver also employs this feature, as well as positive sockets for the servo plugs, which are keyed to prevent reverse installation. Four TSS-50 high-torque servos are included with the set, as well as a 500-mAh Ni-Cd battery, wall charger, servo tray, and assorted servo outputs.

Transmitter Type: *Two-stick digital proportional*
Weight: *28 ounces*
Power Output: *500 Mw*
Frequencies: *72 MHz*
Modulation: *AM*
Servos: *TSS-50*
Power Supply: *Ni-Cd*

2- and 3-Channel Transmitters

Airtronics SR 2 and SR 2L

DESIGNED for the first-time modeler, the Airtronics (11 Autry, Irvine, CA 92718) SR 2 and SR 2L transmitters provide a low-cost entry-level system that offers all the quality, reliability, and features usually found only in more expensive R/C radios, such as servo-reversing, dual single-axis stick assemblies, readout meter, switch harness, servo arms and trays, and frequency flags.

Transmitter Type: *2-channel, two-stick*
Weight: *22 ounces with batteries*
Frequencies: *27, 72, and 75 MHz*
Modulation: *AM*
Servos: *94631, 94461*
Receiver Type: *2-channel AM*
Power Output: *500 Mw*
Power Supply: *Ni-Cd or dry cell*

Aristo-Craft Hitec Challenger 250

THE CHALLENGER 250 from Polk's Model Craft Hobbies (346 Bergen Ave., Dept. 20A, Jersey City, NJ 07304) is a low-cost 2-channel radio for sailplanes and small aircraft needing two functions. It is of digital design and high quality. The transmitter case is housed in tough plastic and a handle is molded on the top for easy carrying.

Transmitter Type: *2-channel, two-stick*
Weight: *14 ounces with batteries*
Frequencies: *27, 72 and 75 MHz*
Power Output: *500 Mw*
Power Supply: *Alkaline batteries*
Modulation: *AM*
Servos: *HS-402*

Circus Two-Stick

THIS RADIO from Circus Hobbies (3132 S. Highland Dr., Las Vegas, NV 89109) was designed with your budget in mind. Although a low-cost unit, it still employs many features found on more expensive sets, such as servo limit travel systems for both servos, optional power supply, and sturdy construction. Available for boats, cars, or airplanes, the Circus 2 will fill the bill for reliability and versatility.

Transmitter Type: *Digital proportional*
Weight: *15 ounces*
Frequencies: *72 and 75 MHz*
Modulation: *AM*
Receiver Type: *2-channel AM*
Power Supply: *Alkaline or Ni-Cd*
Servos: *JR 505*
Power Output: *450 Mw*

Transmitter Type: *2-channel, two-stick*
Weight: *18 ounces with batteries*
Frequencies: *72 and 75 MHz*
Modulation: *AM*
Receiver Type: *2-channel AM*
Power Supply: *Alkaline*
Servos: *Standard IC*
Power Output: *500 Mw*

Cox R/C Systems

THE COX (1525 E. Warner Ave., Santa Ana, CA 92705) R/C system is a low-priced 2-channel set that features two micro-servos, two joy-sticks, a handsome transmitter, frequency flag, and convenient holder for the low-cost alkaline batteries.

Tower Astro GX202

THE ASTRO GX202 is a low-priced, 2-channel aircraft radio system from Tower Hobbies (P.O. Box 778, Champaign, IL 61820) that offers reliability and rugged construction. The transmitter is a lightweight unit that has two sticks with smooth action and positive centering. The receiver has plug-in receptacles conveniently located for positive connections, and the battery holder has secure fasteners to prevent the cells from coming out in those high-G maneuvers.

Transmitter: *Two-stick digital proportional*
Weight: *18 ounces*
Power Output: *500 Mw*
Frequencies: *72 and 75 MHz*
Modulation: *AM*
Servos: *IC*
Power Supply: *Alkaline*

How To:

by RANDY RANDOLPH

MAKE A NOSE GEAR STEERING ARM

Sometimes it's much more convenient to steer the nosewheel below the fuselage rather than through the firewall. The photos show how to make a control horn that will go through the wire spring and provide positive control for the nose gear.

1. The materials needed are the nose gear, a length of 5/16-inch hardwood dowel, two No. 4 round-head machine screws, 1/4 and 3/8 inch long, and a 3/8-inch metal washer.

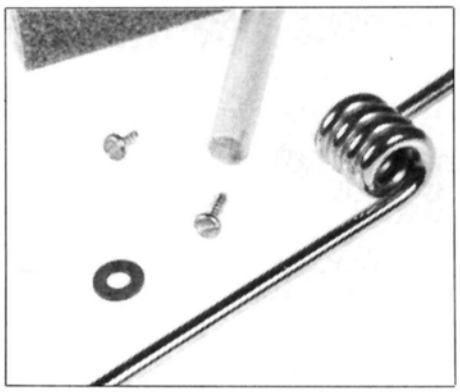
2. The 5/16-inch dowel will fit most gears, but it's a good idea to check the fit in your gear. Some gears could require a larger, or a smaller, dowel. The fit should be tight!

3. Sand a double-sided flange on one end of the dowel. The flange should be 3/32-inch thick and about 5/8-inch long. When sanding, don't press down hard on the sandpaper, let it do the work!

4. The overall length of the arm is your choice. The longer the arm, the wider the minimum turning radius will be. About 2 3/4 inches seems about right for most airplanes.

5. Drill three 1/16-inch holes in the steering arm. One is centered in the end, one is into the side 3/8 inch from the end, and the last is through the flange, centered 1/8 inch from the outer edge.

6. Drive the 1/4-inch screw into the side hole, slip the arm through the spring, then pull it tight with the washer and remaining screw. The arm should be painted with fuel-proof paint to match the fuselage.



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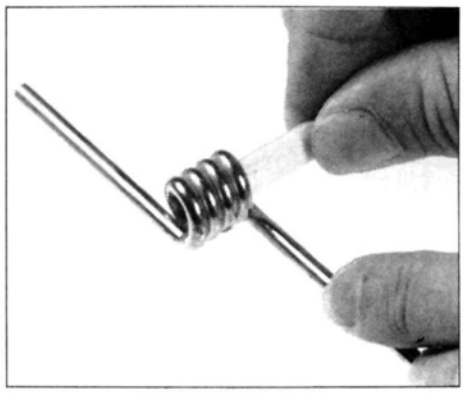

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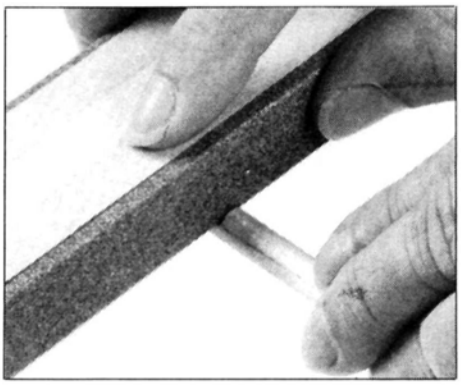

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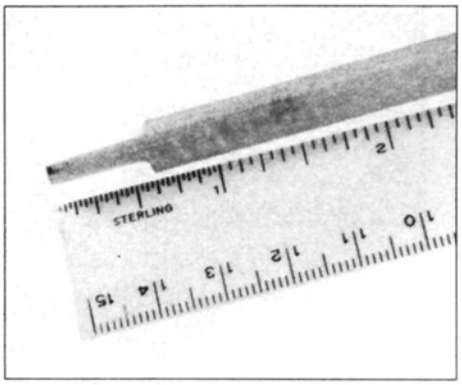

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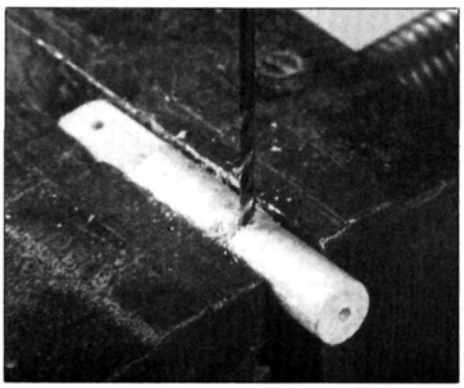

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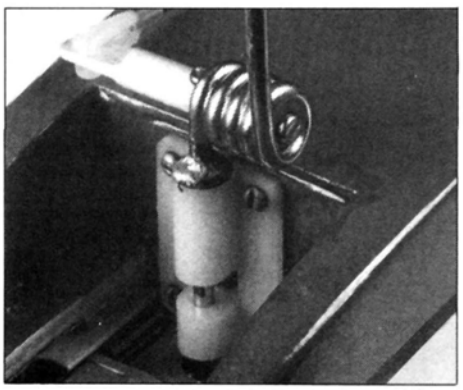


6.

Aero Fox

AeroFox exhibits those qualities necessary in a more advanced design.

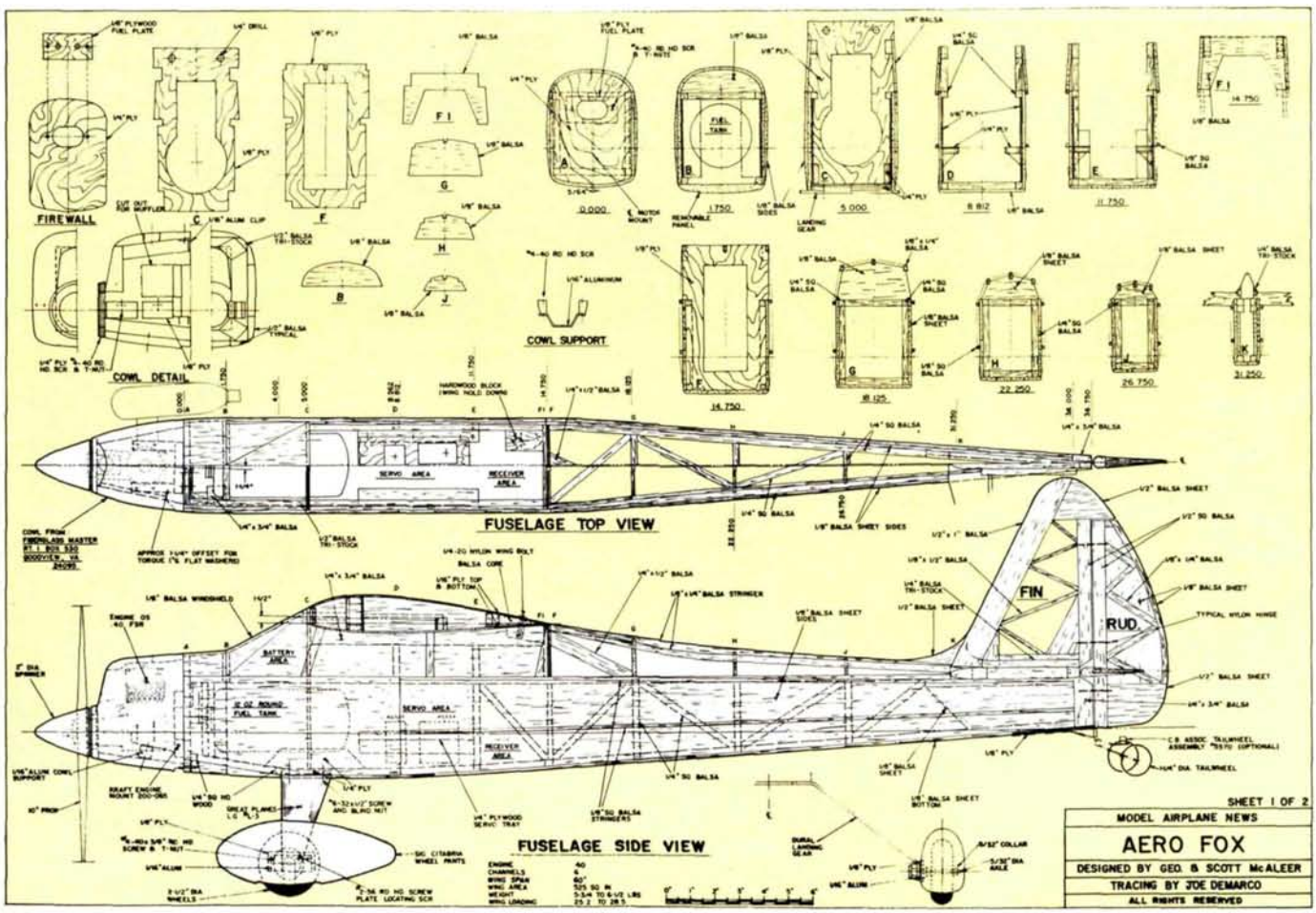
by GEORGE and SCOTT McALEER

Type: *Sport*
Wing Span: *60 inches*
Wing Area: *525 square inches*
Weight: *5¾-6½ pounds*
Wing Loading: *25.2-28.5*
Channels: *6*

MY SON, SCOTT, now seventeen, learned to fly R/C four years ago. After two seasons with an underpowered basic trainer, which Scott learned to handle extremely well, and a season of a sport-scale Piper Tomahawk with totally unpredictable behavior, which he also learned to handle well despite its shortcomings, it became obvious that if his flying was to advance, he'd need a fast, maneuverable, and stable advanced trainer.

After deciding that none of the kits suited our needs, we chose to design our own advanced trainer, including all the features we considered desirable, including the sleekest lines we could think of.

Over a period of several weeks we



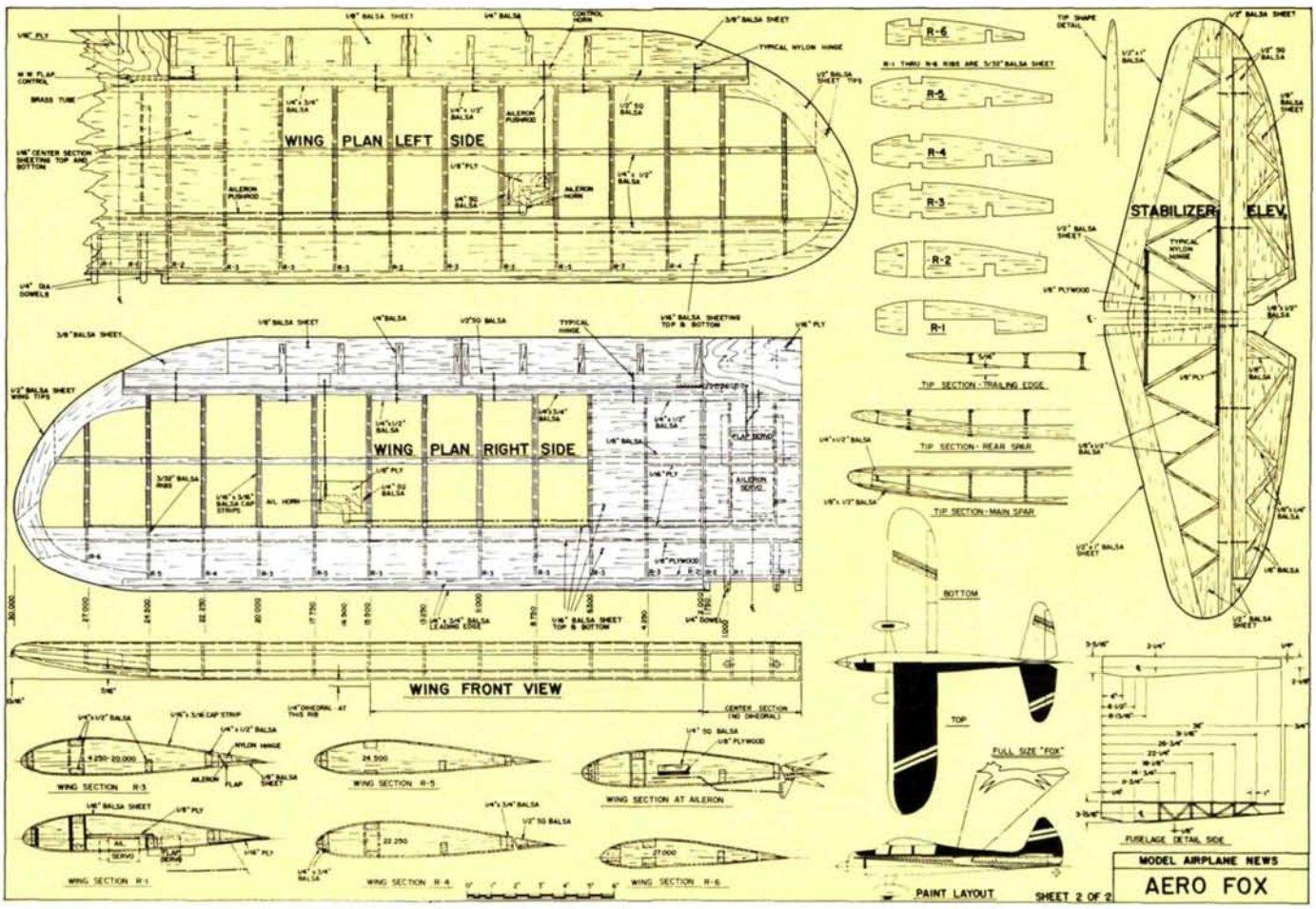
compiled a list of these desirable features: a high wing for stability, good maneuverability, adequate power, a tail-dragger with a wide tread, semi-symmetrical airfoil, washout, and flaps. To improve performance and esthetics we included in our design a low profile, low frontal area, wheel pants, a fully cowled upright-mounted engine, and slightly upturned wing tips. To mount the engine and to fully cowl it, to reduce drag and improve cooling, we lowered the thrust line until the engine would totally fit within the cross-section of the fuselage. The method of construction would include everything we'd learned up to that point.

We made sketches, refining the design each time until we liked what we had. We already had an OS 40 FSR engine, so the AeroFox was designed around that engine.

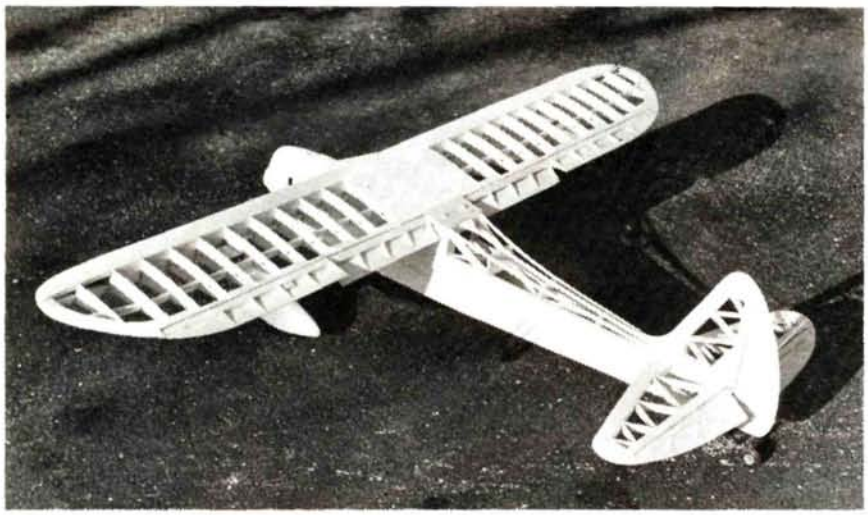
The AeroFox was ready when the flying season opened in the spring of 1985. Even with his somewhat limited experience, Scott decided that he would test-fly it. After double-checking everything, alignment, trim, etc., and deciding it was as close to perfect as possible, we headed for the flying field. The first day was windy, so we made only two fast runs across the length of the field, lifting off only about a foot and then setting down again. It lifted off in grass at quarter throttle, and seemed stable and flyable.

The next visit to the field, the AeroFox was fired up and lifted gracefully into the air. He climbed to a couple hundred feet

Clean lines and streamlining give the AeroFox a sleek and functional look.



FULL-SIZE PLANS AVAILABLE...PAGES 124, 125



Proof that form follows function, this skeletal view reveals the secret.

then made the necessary slight adjustments to the trim. To our delight and amazement, the AeroFox flew superbly, as we'll fully explain later. The balance had worked out perfectly, and to this day the only modification necessary was to increase the aileron movement slightly. Otherwise, from the first day the AeroFox has performed admirably.

As mentioned before, the AeroFox was designed exclusively around an OS 40 FSR engine, and while the finished AeroFox weighs 6½ pounds, the 40 FSR propels it at an amazing speed and provides ample power for aerobatics. With one exception, a larger, or different engine may not fit within the close-fitting cowl. As the 1985 flying season drew to a close, the AeroFox had completed 70 successful flights, each averaging about 15 minutes. This adds up to 17½ hours flying time. The 12-ounce fuel tank will, depending on the type of flying, give between 20 and 30 minutes of flying.

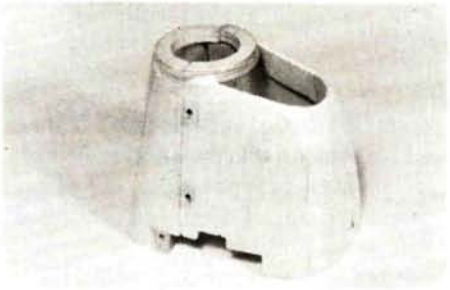
We have since built a second AeroFox, used primarily for the construction photos, and have reduced the weight slightly. We also have found that an OS 45 FSR and FSR ABC are dimensionally the same as the 40 FSR. The new AeroFox uses the 45 FSR ABC, and with the 20% increase in power, and the lighter weight, the results should be interesting when the 1987 flying season arrives.

CONSTRUCTION. In general, the construction of the AeroFox is conventional. There may be a few areas that require some clarification, but, for the most part, there should be no problems.

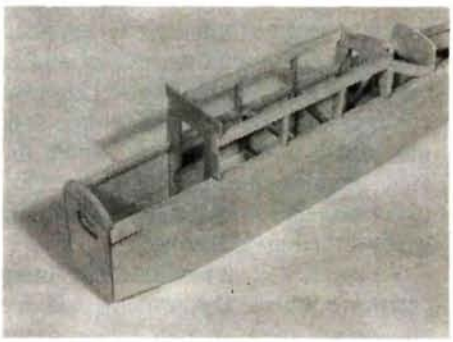
The fuselage sides are built right on the ⅛-inch-thick balsa sides. The location of the ¼-inch-square balsa strips are shown in the small detail on the plan. Be sure to make one left-hand and one right-hand side. Add the 1/16-inch-thick plywood doubler to each side. Glue the two ⅛-inch-thick plywood bulkheads (#C and #F) in place first. The sides are parallel between #C and #F. Complete the construction between #C and #F, and add an extra ¼-inch-square balsa cross-piece at the top at #E. This will help hold the sides parallel when the tail of the fuselage is glued together, and can be removed later when the fuselage is completed.

From #G the sides are straight all the

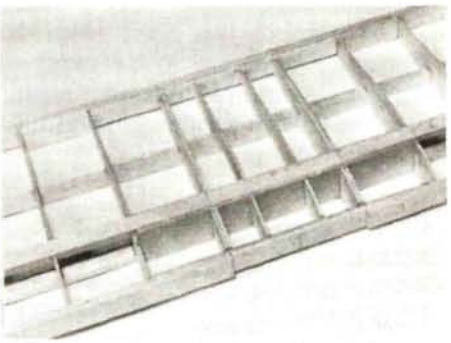
(Continued on page 86)



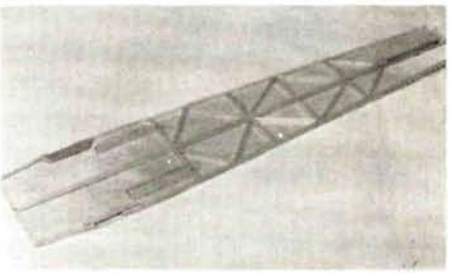
Cowl is built up from balsa and ply.



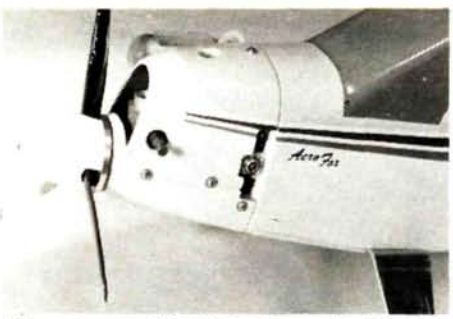
Fuselage framework is simple and effective.



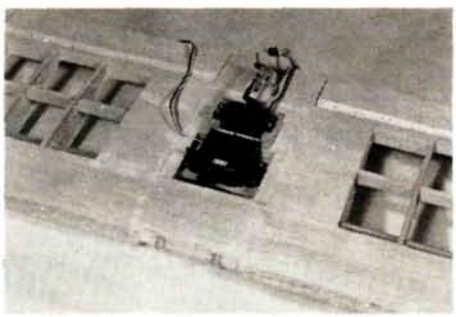
The wing center section shows plywood doublers.



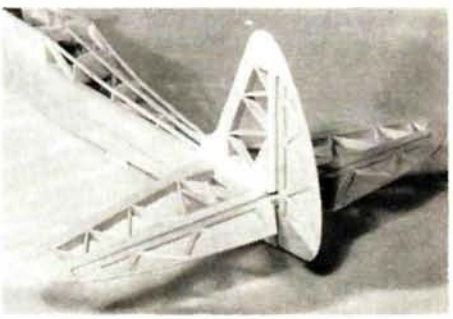
Build left and right fuselage sides the same.



The neatness of the design is seen in this nose shot.



Wing houses aileron and flap servos.



Tail group uses geodetic-type construction.

Type: Sport
Channels: 4
Wingspan: 50 inches
Wing Area: 443 square inches
Engine: .25-.40
Weight: 4½ pounds

Field & Bench Review

by ART SCHROEDER

ALMOST READY to FLY (ARF) is a kit style that has become generally acceptable to R/Cers today. 'Twas not always so. For years they were often the object of uncomplimentary statements, picking up names such as "rubber ducky." "Real" modelers, certainly competition fliers, wouldn't touch them. Strange, since ARFs flew well even in their early versions.

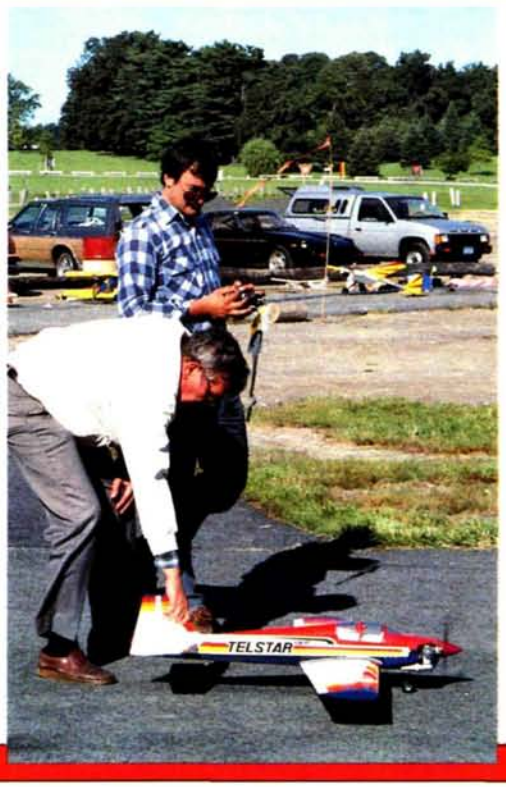
Things really changed when the late great Jim Kirkland actually competed in World competition with a Lanier ARF of his famed Citroen. ARFs gained a lot of respectability and, I think, my own design, the Eyeball by Dee Bee, added to that credibility. That mid-winger was flown at a World Championship by a member of the Finnish team in 1971 at Doylestown.

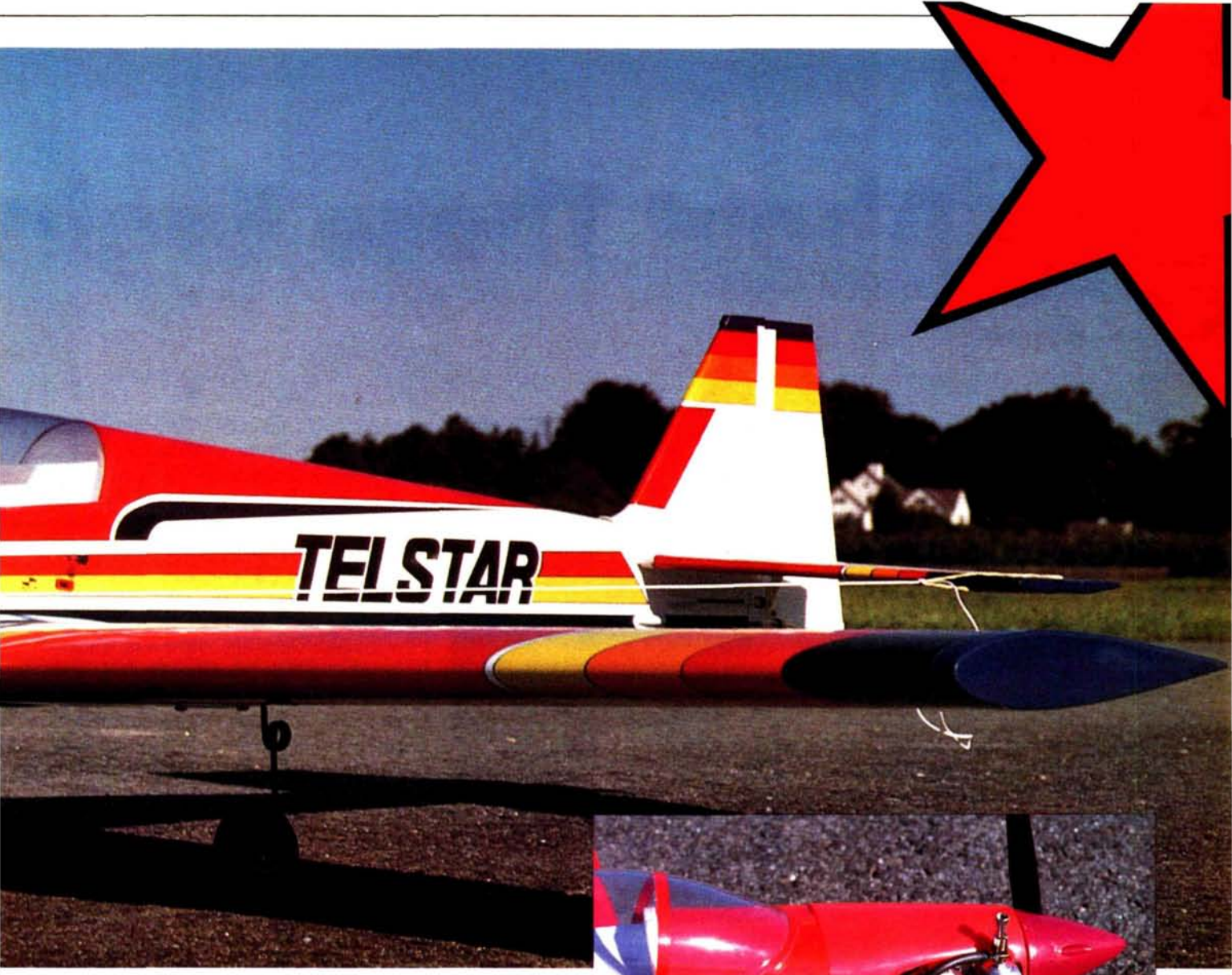
Royal TELSTAR

Royal's answer to the fun-fly crowd.

Today, ARFs are found at all American flying fields. The change has come from advanced concepts that have replaced earlier primary vacuum-formed plastic fuselages. There are now built-up wooden frameworks that are in turn covered and shaped with a plastic (no longer the load-carrying material) composite material sheeting. ARF wings are often foam (covered with a variety of materials), but just as often are built-up structures, covered, and ready-to-go. The true ARF requires no painting since the color is either in or on the covering. There also are ARFs that feature pre-finished fiberglass fuselages. Fully framed and covered aircraft are available and even colored-but-uncovered for all expanded polystyrene machines.

In any event, ARF aircraft are emerging and no longer gain their owners the old "horse laugh." The growing popularity of ARFs has come from modelers who like the low workshop time they permit (we'd all like fewer hours in the dungeon). But





they have also been adopted by those who appreciate their flight consistency. A lost bird easily is replaced by another with identical flight performance. Wing warps and misaligned surfaces are nearly impossible with today's ARFs. And, as always, the ARF is the quickest way back into the air after a disasterous weekend when your favorite, and perhaps only, conventional plane has been destroyed. That surely is better than becoming a spectator at your field. Add to all of this the fact that so many great-looking offerings have come along in recent years. It's now possible to place sharp-looking scale and sport jobs and easy-flying trainers on the flight line in about 10 hours.

But not that many pattern birds! At least that surprises me, for the consistent flight qualities inherent to ARF aircraft should be a natural for pattern. I'm not considering the many fiberglass/foam airplanes available for pattern since these usually require extensive fiberglass work, sheeting, and finishing.

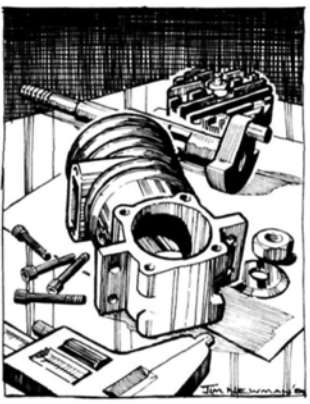
Anyway, Royal Products* has added a new ARF offering that should suit active and prospective pattern fliers to a T! And T stands for Telstar, a small pattern

The Enya performed its task admirably.

machine for .25 power; an airplane that handles AMA or FAI or anything else you want to throw at it.

Okay, I know hard rock pattern competition is played with .60 engines (or 1.20 cycles) and, therefore, Telstar 25 would be overmatched. But that may not really be the case, certainly not in Novice or Advanced classes. And in the right hands it might even do well in other classes. But that's not where I found Telstar's greatest charm. That was found in its absolutely honest responses to control inputs. I found myself timing this airplane very quickly, almost as if I'd been flying it for months. It's certainly an ideal sport plane for anyone

(Continued on page 102)



About Those Engin

by JOE WAGNER

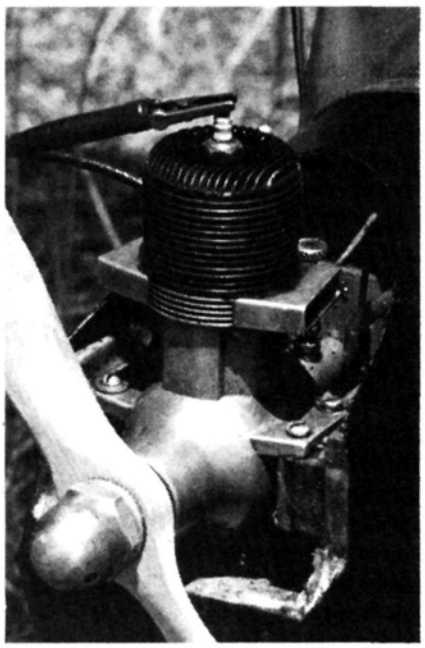
IF YOU LIKE spark ignition engines, there's never been a better time to use them for powering models than now. Besides enjoying the excellent quality of modern reproductions of old-time sparkers, we've gained the advantages of superb batteries to energize their ignition circuits, and far better capacitors ("condensers") than we ever had in the 1940s.

The zinc-carbon pencells that everybody used in their Austincraft battery boxes during the heyday of spark ignition motors were far from reliable. The freshness of these cells was supposedly guaranteed because their manufacturers dated them. Nevertheless, modelers bought them by the box of twelve, and used them up rapidly. I can remember lots of times when I had to replace more than a dozen batteries in just one day's flying.

Modern alkaline cells last five times as long in spark ignition circuits as even today's "heavy-duty" zinc-carbon batteries. The current drain is an ampere or so with the engine running, and sometimes a lot more, as when trying to crank a flooded Forster dry. The voltage of a zinc-carbon cell drops off fast during heavy current drain. Alkalines hold up far better, but best of all for high amperage are Ni-Cds. That's all I've been using myself for years. Soldered in place in the circuit, instead of being held in battery boxes (with their often unreliable contacts), Ni-Cds are as trouble-free as you can get. And they last for over five years if you charge them properly.

The old-time "condensers" were at fault in more engine running problems than I like to think about. They were made of layers of tinfoil separated by waxed paper, wrapped into a tight roll and inserted into a zinc case roughly the size of a .32 pistol cartridge. A flexible wire lead exited from the center of one end, and a metal lug attached to the case served both as a mounting and a ground connection.

One problem was that engine vibration often fractured the lead wire connection to the tinfoil, inside the casing where it couldn't be seen. Innocent young modelers, trusting their condensers because they were shiny and new-looking, would hopefully flip propellers for quite a long time before trying things such as changing condensers. More experienced "gas modelers" came to automatically suspect the condenser when the engine got balky (and it was pretty certain the batteries were all right and the points and plug unfouled). Like batteries, condensers got replaced frequently, and were often bought by the boxful.



The 1946 Scott Thunderbird .60. Besides its internal super charger, it had all its control at the rear for safety.

Condensers failed for another reason than broken lead wire connections. It had to do with excess voltage. Most of us didn't realize this in the 1940s, because we couldn't see how insulation breakdown could happen in a 3-volt circuit.

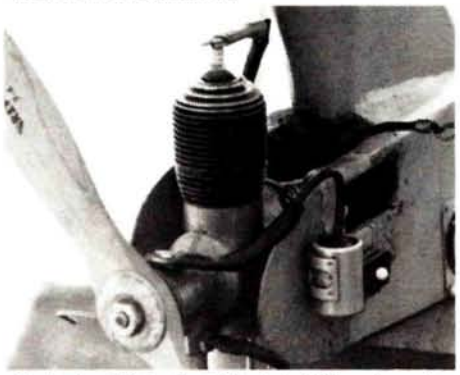
What we didn't know was that although there were surely less than 3 volts across the ignition points and condenser, when the points closed and opened the spark coil's magnetic field generated some 250 volts for a millisecond or so. This was often enough to shoot a spark through a pore or a thin spot in the waxed paper insulation between the condenser foil layers. Repeated, this sparking would weld the foil together. And there went another condenser bad, for no apparent reason.

Today's electronic capacitors, manufactured to high-precision standards and sealed in solid epoxy, fail so seldomly that they can be forgotten about once installed. I haven't lost one in over 20 years. I do modify them, by cutting their solid copper lead wires short, bending them into small loops close to the capacitor body, and soldering on flexible lead wires. I use 400-volt, non-electrolytic capacitors, 0.1 microfarad rating. Even these, however, are becoming obsolete. Transistorized spark ignition circuits need no capacitor across the engine points. They are more complex electrically than the old standard hookups, and more expensive—but they utterly end point sparking and erosion. Besides, they cut R/C interference down to just about zero.

In the "good old days" ingenious people searched for methods of overcoming spark ignition problems. One way was the compression-ignition, or "diesel" principle. (Model engines have never been true diesels, because they lack the diesel's fuel injectors.) The idea was to eliminate the points, coil, condenser, plug, wiring, and batteries; and use high compression alone to ignite the fuel mixture.

This development began in Europe during WW II, and rapidly became popular there after the war. In the USA, however, the model "diesel" never saw wide use, despite the attempts of several manufacturers to promote them. First was the C.I.E. .10 of 1946, and last was the 1955 McCoy .049 diesel. (Nowadays diesel conversions of glow engines are being made and used to some extent. But no designed-as-a-diesel model motor has

The Drone .29 with its black case and gold-anodized head was the best-selling post-war model diesel in America.



An Arden .19, the best-liked of all Class A spark-ignition engines. Note condenser at right.

been manufactured in America for over 30 years.)

Among the major types of U.S. diesel model engines, the Drone was the most outstanding. A reader in Iceland, Asgeir Long, sent me photos of a Drone he acquired, and asked how to go about running it, since it had no means of adjusting compression such as European diesels use.

Asgeir's inquiry brought many memories back to me, and I was able to tell him a lot about the Drone. I owned one of the first production models, exactly like his engine. I bought mine in February 1947. Eager to try out such a novel motor, I unbolted the Ohlsson .60 from a heavy U-Control trainer I had handy and put the Drone in its place. I didn't even take the time to remove the spark ignition system, but quickly mixed a pint of the recommended fuel (a blend of ether and mineral oil) and rushed to the flying field to give the Drone a try.

It was amazing! Although the Drone was only a .29, it pulled my model around the circle far better than the big Ohlsson had ever managed. I flew it several times, with equal success, while great plans formed in my mind. Because the Drone was so new on the market, I was sure that none of them would be likely to be bought in my area if I kept quiet about how well mine had turned out. Then when summer came, I could overwhelm the Class B competition with my .29 diesel that outperformed .60 sparkers.

But things didn't work out that way. When the warm weather arrived I could hardly get the Drone to run at all, let alone outdo any .60s.

The theory behind the Drone's fixed compression design was that the fuel mixture could be adjusted to meet changing conditions. Instead of taking the European route of varying the compression, the Drone folks assumed that altering the proportions of ether to oil would do just as well. But they were wrong.

A few lucky fliers managed to find the right combination for fuel, and won important U-Control events with Drone-powered models. But for most of us Drone owners, fiddling with the fuel was most unrewarding. For one thing, ether evaporates fast. Every time I opened my diesel fuel bottle the ether percentage probably dropped a couple of points. If I did happen to get the mix right for one engine run, then next time I fueled up it would be incorrect.

In 1948 the Drone makers improved their design somewhat, with ball bearings and a more streamlined case. But they stayed with the fixed-compression head—and that doomed the motor. Late in '48 they did offer a variable-compression

(Continued on page 103)

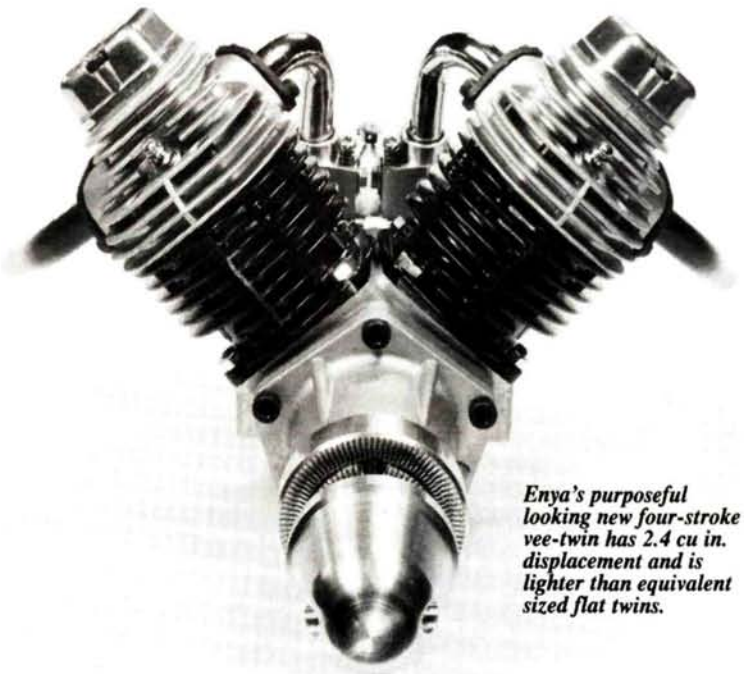
Engine Review Round-Up

by PETER CHINN

ENYA VT-240

SPECIFICATIONS

Type: Air-cooled, 80-degree vee twin cylinder four-stroke-cycle with pushrod operated overhead valves.
Bore: 31.0 mm (1.220 in.)
Stroke: 26.4 mm (1.039 in.)
Displacement: 39.85cc (2.432 cu in.)
Nominal Compression Ratio: 7.2:1
Speed Control: Two Enya G-Type carburetors with coupled throttles.
Checked Weight: 1.71 kg (3.78 lb) including cast aluminum firewall mount.
Mounting Dimensions:
Overall width, less exhaust pipes: 161 mm
Length from prop driver face including firewall mount: 150 mm
Height above CL: 93 mm
Radius (CL to top of rocker box): 110 mm
Bolt hole spacing: 54x54 mm
Manufacturer's Claimed Power Output: 3.2 bhp at 10,500 rpm.
Manufacturer: Enya Metal Products Co. Ltd., Nerimaku. Tokyo 176, Japan.
U.S. Distributor: Altech Marketing, P.O. Box 286, Fords, NJ 08863.



Enya's purposeful looking new four-stroke vee-twin has 2.4 cu in. displacement and is lighter than equivalent sized flat twins.

BIG SINGLE cylinder engines—especially big single cylinder four-strokes—do not run smoothly. There are two reasons for this.

First, it is impossible to balance a single cylinder engine properly. Second, a single cylinder four-stroke-cycle engine has a firing stroke only once for every two revolutions of its crankshaft, but, in each of those infrequent power impulses, the single cylinder four-stroke packs a mighty wallop. In other words, an immense amount of torque is developed during the expansion stroke, but this is followed by three idling strokes during which negative values occur.

Such is the sheer jerkiness of this torque delivery, that an internal combustion engine will not start and run without a flywheel. (In the case of an aircraft engine the propeller serves as the flywheel.) A flywheel or prop stores some of the energy developed during the power stroke, then releases it to carry the engine through its exhaust, inlet and compression strokes. But this does not alter the fact that, through the operating cycle, torque fluctuates enormously and peaks at many times the *mean* torque. Mean torque is the figure quoted in performance figures or illustrated by test curves.

VT-240 vee-twin layout enables simple single-throw crankshaft to be used and eliminates need for rear main bearing.

VT-240 has Enya 120-4C pistons and liners. Valves are from 90-4C/120-4C, but cylinder-head is new.

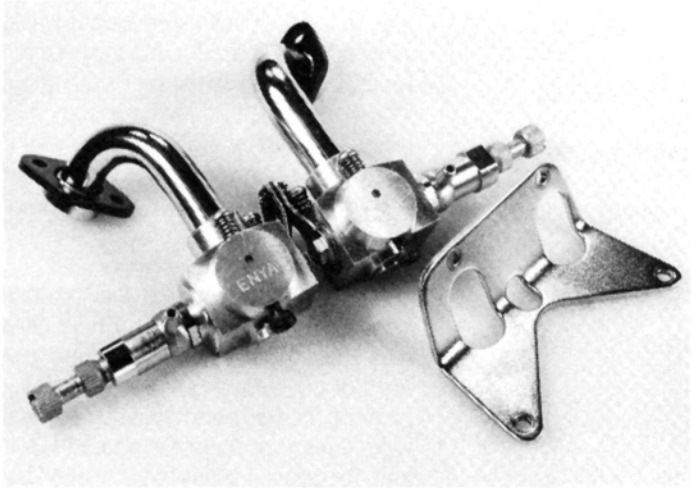
So far as four-stroke-cycle model aircraft engines are concerned, all this means that a 20cc (1.2 cu in.) displacement seems to be pretty near to the maximum size that is acceptable for a single cylinder engine. It is known that one European manufacturer has been working on a 30cc (1.8 cu in.) single cylinder four-stroke but, among existing commercial products, four-cycle engines of more than 20cc displacement invariably have two or more cylinders.

In an alternate-firing twin cylinder four-stroke engine, the variation between maximum and mean torque is halved. (It is halved again in a four cylinder engine—and so on, as the number of cylinders is increased.) Moreover, the reciprocating masses of the engine are better balanced and the net result is greatly reduced vibration and an infinitely smoother running power plant.

There is a price to pay for this—literally. A twin is much more costly to produce. This is not simply because it has two cylinders, two pistons, two sets of valve gear, etc. In the case of a conventional horizontally-opposed or "flat" twin (the most popular layout for aircraft engines) or an inline twin, an expensive two-throw crankshaft is required. This, in turn, means using main bearings fore and aft instead of at the front end only, plus special connecting rods having detachable bearing caps. Assembly time and, in consequence, labor costs, are also increased.

Most of the twin-cylinder model four-cycle engines of 20cc and over, offered to date, have been of this type: for example the O.S. Gemini FT-120, FT-160 and FT-240, Saito FA-270T and Kavan FK-50. There is, however, an alternative twin-cylinder configuration which retains the simple single-throw, overhung type crankshaft of the single cylinder engine.

This is the vee-twin in which both connecting-rods are coupled to a single crankpin. This layout was first employed by the 20cc German Schillings PL-Twin and 30cc British Magnum 182-V and is also used for the British Laser 120-V and 150-V. Now, the Enya brothers of Japan have adopted it for the new 40cc (2.43 cu in.) Enya VT-240 described here. (In passing, we should also mention the smaller Saito FA-80T and FA-90T twins which are unique in combining horizontally opposed cylinders with a single-throw crankshaft. This layout, lacking the balance of the other twins mentioned, is not favored for twin cylinder engines in general, but is an improvement on a single cylinder engine and is acceptable in a small model engine size.)



VT-240 has separate carburetor for each cylinder but throttles are coupled together at center for common servo linkage.

Being less complex than a twin having a two-throw crankshaft, the Enya VT-240, not surprisingly, is also relatively light (less than 3.8 lb) for a 40cc four-cycle twin and is quite compact. True, if one's interests lie in the direction of scale models of modern piston engined aircraft (most of which have horizontally-opposed engines) or, for that matter, in the many older aircraft that were powered by inline engines or narrow-vee twelve-cylinder engines like the Rolls-royce Merlin, Allison V-1710 and Daimler-Benz 601, a vee-twin may not be the ideal shape. In this respect, the VT-240 is likely to be

(Continued on page 74)

Engine Review Round-Up

by PETER CHINN

K&B 20 SPORTSTER

After concentrating its R&D for some years on racing engines, K&B has re-entered the economy field with the new 20 Sportster model.

SPECIFICATIONS

Type: Air-cooled, single-cylinder side-exhaust two-stroke-cycle with crankshaft rotary-valve and Schnuerle scavenging.
Bore: 0.650 in. (16.51 mm)
Stroke: 0.640 in. (16.26 mm)
Displacement: 0.2124 cu in. (3.480cc)
Nominal Compression Ratio (full stroke): 9:1
Speed Control: K&B barrel throttle carburetor with adjustable automatic mixture control
Checked Weights: 223 grams (7.9 oz) less muffler, 278 grams (9.8 oz) with muffler, and 289 grams (10.2 oz) with muffler and radial mount
Mounting Dimensions:
Crankcase width: 1.185 in.
Length from prop driver face: 2.95 in.
Height above CL: 2.27 in.
Bolt hole spacing: 1.50x0.59 in.
Manufacturer's Claimed Power Output: Not stated

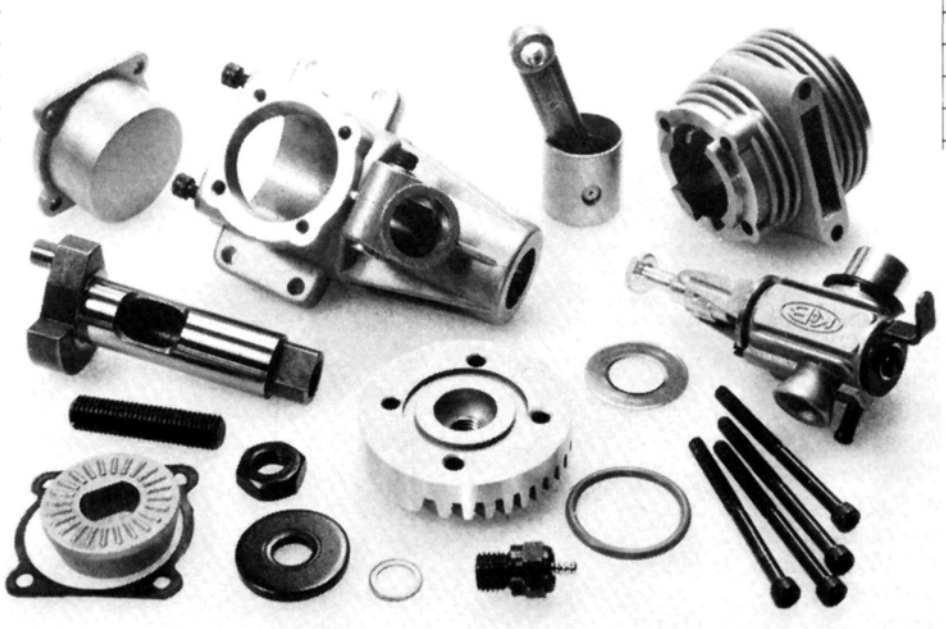
Manufacturer: K&B Manufacturing Inc., 12152 South Woodruff Avenue, Downey, CA 90241.

THIS YEAR, 1986, is a rather special one for two of the world's leading model engine manufacturers. It is exactly fifty years since Shigeo Ogawa produced the first O.S. engine, the O.S. Type-1, in Japan and it was exactly forty years ago that Lud Kading and John Brodbeck began manufacture of the first K&B engine, the Torpedo 29.

Actually, K&B first opened its doors in July 1944. Beginning as a modest machine shop operation engaged in turning out replacement aircraft parts (for wartime Lockheed P-38s and Republic P-47s), K&B was later commissioned to make parts for the highly secret Manhattan Project, although it was only after the event that K&B learned of the momentous implications (i.e., the development of the first A-bomb) of this association. After the war, in complete contrast, K&B's first in-house product, later patented, was a lawn sprinkler. It was the success of the sprinkler that generated the funds for tooling up the first K&B engine. The Torpedo 29 had been designed and originally built by Bill Atwood, one of the pioneers of commercial model engine production. The K&B version was released to the market in December 1946 and was an instant success.

Since that time, K&B has produced large numbers of engines for both beginners and experts but, during recent years, most of the company's new motors have been of the high-performance or racing type—many of them for ducted fan use and for power boats where they have

K&B 20 includes a new automatic mixture control carburetor and combines highly competitive performance with moderate price.



K&B 20 has many unusual structural features, including use of new alloys specifically developed for internal combustion engines.

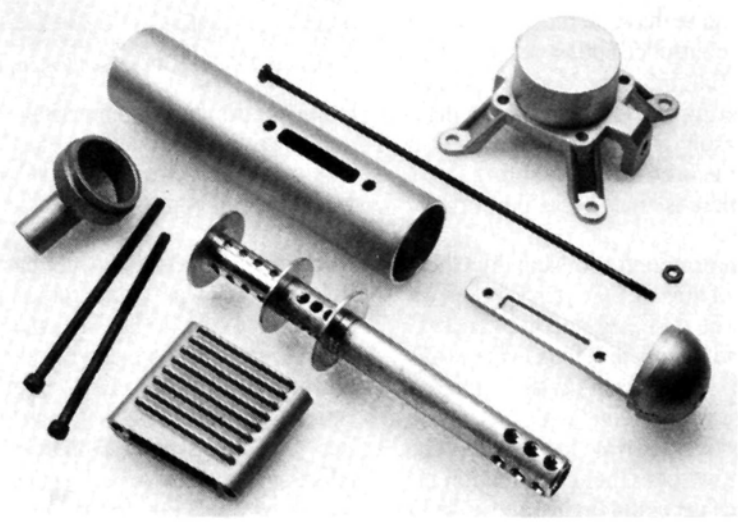
enjoyed a great deal of competition success. Now, company president John E. Brodbeck tells us, K&B has embarked on the development of a range of modern sport/economy engines. The first of these is the new K&B 20 "Sportster" engine, illustrated here.

Like so many K&B sport type engines of the past, dating right back to the original Torpedo 29, the 20 Sportster is a front rotary-valve, plain bearing, side exhaust engine. But here the similarity ends. The new engine has a unique six-port cylinder, no liner, no piston-ring and no bushing for its plain main bearing.

The secret is in K&B's adoption of one of the new breed of aluminum alloys combining a low coefficient of friction with exceptional hard-wearing qualities. Presumably, this alloy is related to the special alloys recently developed for automotive use and, if anyone has doubts about the feasibility, for a high-quality engine, of running a suitable piston directly in an aluminum cylinder bore, we would just mention that both Mercedes-Benz and Porsche (who are not exactly noted for turning out lemons) are doing just that in some of their latest high-performance automobile engines.

The K&B 20 Sportster is built around two very solidly proportioned castings in this new alloy: the cylinder and the crankcase complete with front housing.

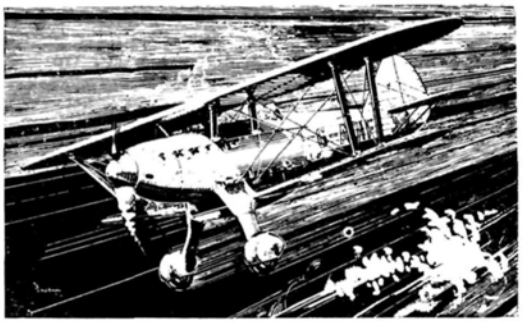
Included with 20 Sportster are an effective exhaust muffler and an optional backplate radial mount with integral nose-leg brackets.



The former is spigoted into the latter and the two components are tied together by four long 4-40 socket head cap screws that pass from the separate cylinder head through the cylinder and into the crankcase. The head has a bowl-and-squish-band combustion chamber, and a recessed high-temperature O-ring, rather than the usual copper or aluminum gasket, is used to make the head joint.

The Schnuerle-scavenged cylinder has a single unbridged exhaust port, flanked, each side, by twin flute type bypass ports and with a wide "third" or "boost" transfer flute diametrically opposite. Port timing is conservative with, according to measurement of our test engine, a 140 degree exhaust period, a 118 degree Schnuerle port period and a 120 degree third-port period. To provide a suitably hard surface for use with the aluminum cylinder bore, the ringless aluminum piston is chrome plated. A tubular 5/32 in. o.d. wristpin couples the piston to the unbushed connecting-rod. The hardened

(Continued on page 54)



Golden Age of

by HAL "PAPPY" deBOLT

WHETHER it was obvious or not, when I asked who had the first R/C in the inaugural edition of "Golden Age," it was with tongue in cheek. With all the research done, *still* everyone is not really sure whether the Wright brothers actually flew first. We surely couldn't expect much different in R/C! However, the input concerning the first R/C has been interesting.

Gary Hoppe of Ruthven, Iowa, is an established R/Cer who suggested that Nikola Tesla could have been first with R/C, though not with aircraft. Mr. Tesla was one of the brilliant turn-of-the-century minds, having invented the AC motor and the AC method of distributing electricity, among some 700 other inventions and patents. His patent for a "controlling mechanism" was granted in 1898.

He is said to have demonstrated two remotely controlled boats at the first Electrical Exhibition in Madison Square Garden during 1901. One was a submarine! It's hardly R/C as *we* know it, but from little acorns tall oaks spring forth. The sad part is that Tesla purportedly died broke.

From information furnished by Chester Lanzo of Sun City Center, Florida, we know that he designed and built an R/C system and plane in 1934. While this particular system wasn't flyable (the engine ignition interfered with the radio), the plane was flown free-flight. The records show that Chet continued in his efforts, had successful flights, and in 1937 succeeded in winning the first R/C Nationals.

Note the time period, '34 to '37, which seems to be the earliest that people were having success of any kind. We know that many were working with R/C though their results remain a mystery; perhaps what is more important than who might have gotten airborne a month or year before another is *who the people were* and how they pointed the way to the wonderful sport we enjoy today.

Howard McEntee was a good friend to all R/Cers, including your author. His major contribution to our heritage was his many writings chronicling the R/C doings of his day. From Howard's reports we learned of a group that was probably one of the first.

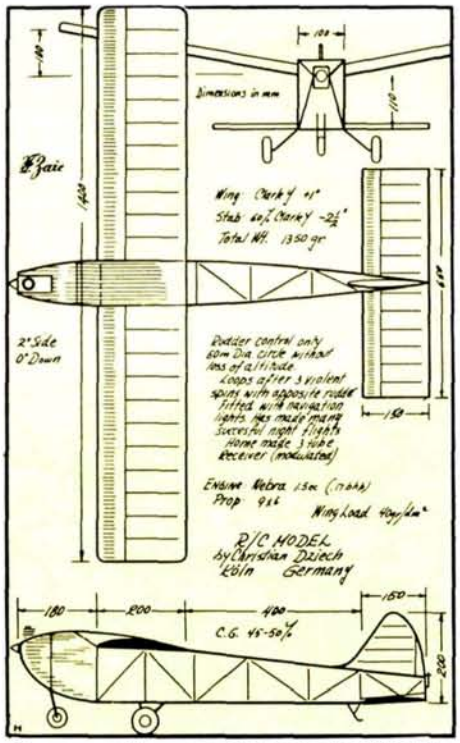
Walt and Bill Good with their famous Big Guff. The box at right is the transmitter power supply!

In the mid-'30s the American Radio Relay League was to ham radio what our AMA is to us today. At the ARRL headquarters in Connecticut were three ambitious leaders, Ross Hull, R.B. Bourne, and Clinton Desoto, who felt that R/C had possibilities. Apparently, their efforts were extensive over a considerable period of time. For flight they chose a glider rather than using power and had success with it. The record indicates that they weren't beyond some "monkey-shines" either.

In 1937 the full-scale National Soaring Championship was held at Elmira, New York. The ARRL group thought it would be cute to enter their R/C glider in this competition—apparently the rules didn't specifically require a pilot! Shades of Maxwell Bassett with the first gas model entry in the AMA Nats! As it turned out, upon arrival at Elmira the Soaring Society officials wouldn't allow the model to compete, unlike the AMA, which had allowed Bassett to fly.

Anyone who's been to Elmira's "Harris Hill" is aware of what a wonderful soaring spot that hill's bluff is for full-scale or models. For example, I once got a single-channel R/C into that lift, and in spite of my efforts, it took over an hour to get it down. Even when held in a spiral dive, the lift wouldn't allow it to lose altitude! So when I learned that the ARRL glider had been allowed to make exibition flights it's not hard to imagine how impressive they must have been. Of course the ARRL continued with their ham radio efforts and from the group Clinton Desoto went on with powered R/C and made his mark in early competition.

Bill and Walter Good are often referred to as the fathers of R/C and the acclaim is well-deserved. Richard Smith of Gaithersburg, MD, is a OT modeler who started with many of us in the early '50s. Dick called our attention to the U.S. Navy's *Missile Technician's Manual,* which states that Walter Good flew the first R/C model in 1935. Dr. Good's



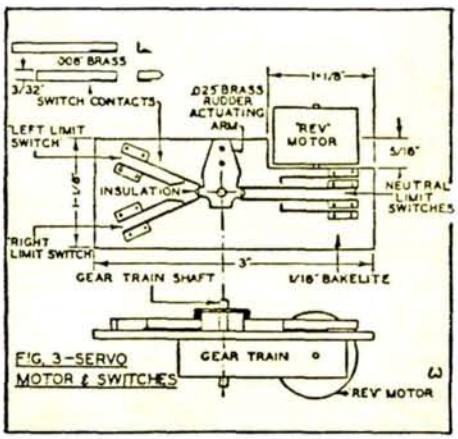
German modelers were also developing R/C, this one by Christian Bziech.

writings indicate that he and brother Bill were active in that era. His report of the 1937 Nats tells that the Good brothers brought a test-flown R/C model (Big Guff) to the Detroit meet. They were unable to fly it because a storm closed the R/C event down early that year. The Good brothers' continued success with R/C is a legend, and what they achieved our inheritance.

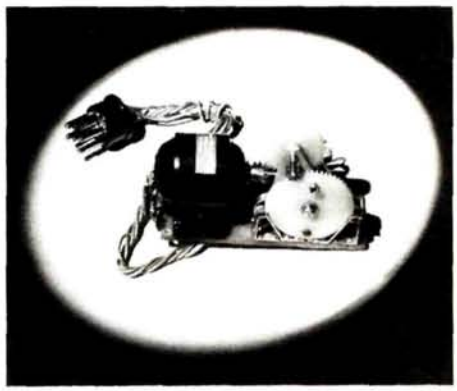
Dan Swinehart of Ashland, Ohio, is another active OTer who participates with a group that includes Chet Lanzo. Dan informed us that Dave Mauer is active with them and still remembers his "Flying Bison" days back in Buffalo. Dan also provided a copy of a German *Modellflug* magazine dated August 1936, which reminded us that R/C always has been international.

While this report was written in German, I could decipher that its major concern was a Modeling Olympics held at the Templehof in Berlin. The scheduled events apparently were free-flight. Of interest to R/Cers was an exhibition of what looked like a 6- to 7-foot model by Alfred Lippitfch and Egan Gnfora of Dresden. Pictures of the model's R/C gear depicted what resembled an advanced three-stage receiver with a relay-operated actuator. The tubes showing looked looked like the large vacumn-type used in radios of that day. While a translation of the lengthy German text would be interesting, what we can immediately learn is that others outside the U.S. were investigating R/C at the same time. The advanced nature of this example

(Continued on page 122)



The original Rockwood multi-channel servo was extracted directly from a toy.



The final version of several styles of multi-channel servos built by Schmidt R/C. Motor came from toy industry.

The dmeco multi-channel servo ad from the mid '50s. Contacts on the outside of cam wheel established neutral. Those in front determined the amount of control deflection.

K&B 20 SPORTSTER

(Continued from page 51)

steel crankshaft has a 12 mm main journal, a 3/16 in. dia. crankpin and a detachable 1/4-28 prop stud. It has a parallel sided valve port that is timed to open at 43 degrees ABDC and close at 46 degrees ATDC (our measurements).

The 20 Sportster is equipped with a new K&B automatic mixture control carburetor. This is of the type in which fuel is metered by the rotation of a tube surrounding the jet tube. The jet tube has a tapered slit type jet and the concentric outer tube, which moves with the throttle barrel, has a radial hole that uncovers more of the slit as the throttle is opened. The jet tube incorporates an outer disc which can be rotated a few degrees either way, by means of an eccentric screw, to precisely adjust the degree of mixture compensation at part-throttle settings.

Two very useful accessories are included with each 20 Sportster engine. The first is a special backplate spider mount that can be used in place of the regular beam mounting lugs to enable the engine to be radially mounted to the firewall. This also has a pair of lugs for mounting a 5/32 in. diameter steerable nosegear leg.

The second item is an effective muffler. This is not the usual plain unrestricted expansion box. Instead, it contains three baffle plates and a perforated tube through which gases are passed from one chamber to the next, before being released through the outlet stub. The latter emerges at a 45 degree angle from the tailcone, enabling the outlet to be rotated to the most convenient position. Not unexpectedly, the muffler knocks a bit off the engine's performance but this can be partially restored by inserting a tailpipe of 6.5 mm o.d. Teflon tube into the outlet stub to aid exhaust gas extraction.

K&B suggests a 9x4 prop as the starting point with the 20 Sportster. With such a prop and using K&B 500 fuel, the factory quotes typical rpm figures of 13,200 at full throttle and 2,300 at idle on the K&B standard long-reach plug supplied, or 13,000/2,100 rpm with a K&B idlebar long-reach plug. Watch *M.A.N.* for a full test report on the 20 Sportster at a later date.

Peter Chinn, c/o *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897. ■

One of the finest trainers going, the PT 20 teaches you how to be a modeler as well as a pilot.

PT-20

from Great Planes

Type: Trainer
Wingspan: 52 inches
Length: 42 inches
Wing Area: 510 square inches
Radio: 3 channel
Engine: O.S. 20 FP
Weight: 3¾ pounds

by RANDY RANDOLPH

THE GREAT Planes* PT-20 is the first model kit I've built in many years. In fact, in the last 35 years I've built no more than five kits! However, in that time-span I've built literally hundreds of airplanes and inspected that many more kits.

As a general rule I prefer my own methods of construction and design to those of others, partly because of my independent nature and partly because I think that kits are designed to accommodate techniques that reduce the cost of manufacture rather than improve the airplane. In many instances my second reason is valid, but *not in this case!*

It appears that the Great Planes people have added touches to accommodate a wide variety of builder's desires, and equipment that could only add to the cost of manufacture, yet they've produced a kit that is designed to be built and flown at a very reasonable cost. For example, it can be built as a three- or four-channel airplane, and the parts for both are included in the kit.

The only criticism I have is that it could be as strong and as airworthy if it were half a pound lighter! In reality this is no criticism because the beefier the construction, the easier it is for the beginning builder to handle.

THE KIT. There is little reason to describe the quality of materials in these kits. The standard of quality in kits produced by major manufacturers today is such that an inferior piece of wood or defective part would be difficult to find. Instead, I'll describe the instruction manual that accompanied the kit—it is excellent.

Some 40 years ago the Heathkit people developed an instruction manual format that has become the standard of the world for electronic kits. They broke the construction procedure down into individual steps, illustrated each, and required you to check each one as it was completed. The PT-20 manual has 40 pages of instructions following just that format. If you can read and follow one-two-three instructions, you can build this airplane and learn enough in the process to build other kits which provide much less help to the builder. I can't emphasize enough how pleased I am with the instructions that come with the PT-20.

As I describe the building of this bird you'll see just how complete the kit is and how instructive the manual. So, let's build!

CONSTRUCTION. The tail surfaces are built from pre-cut 3/16-inch sheet balsa. The manual suggests using cyanoacrylate-type glue and these components are completed almost as fast as they can be placed in position over the plan. Provisions for the hinges are made at this point, but the surfaces are not hinged until after they're

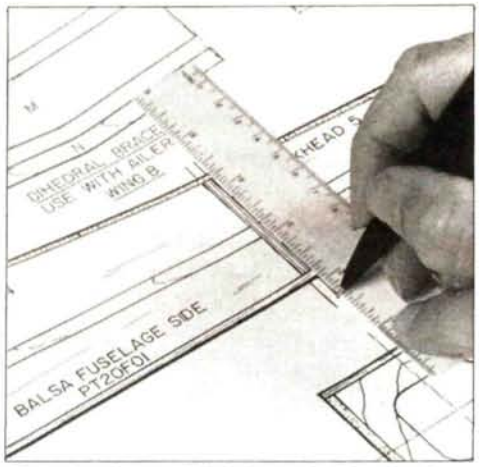
The O.S. 20 FP was ideal; well-suited for the PT-20.

covered (11 photos describe these steps). Balsa has a mind of its own and regardless of the care taken in manufacturing, it will change shape and size, slightly, depending on temperature and humidity. For this reason, dress the edges to be glued together with a good sanding block and the edge of the bench, or some other guide, to assure nice square, true joints.

The fuselage sides are assembled and the sides joined with plywood formers—but watch it because epoxy glue is slippery. When gluing doublers in place, check their position often until the glue has cured (check the photos in the manual). Provisions are shown on the plans for a number of engine installations and materials are provided for each. The mount is assembled as the fuselage is constructed and since I intended to use an O.S. 20 FP, also from Great Planes, I followed the instructions for that engine. The method of joining the sides and adding the bottom pieces almost guarantee a straight fuselage, but it's important to pay attention to what you're doing.

The landing gear is of the torsion type and it's necessary to mark and drill two holes in the gear mount before it's glued

Application of trim is simple using Randy's method. See text.

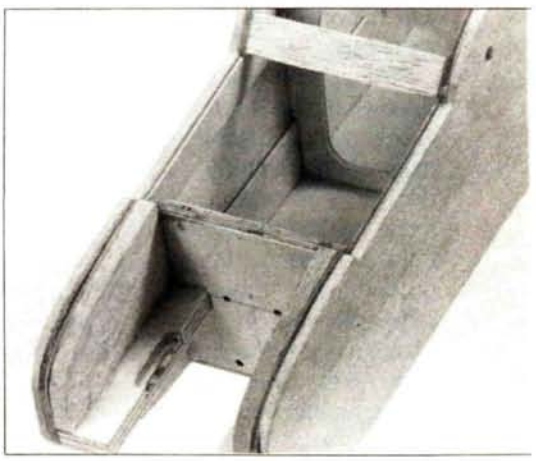


Extension lines will help locate bulkheads when assembling parts on plans.

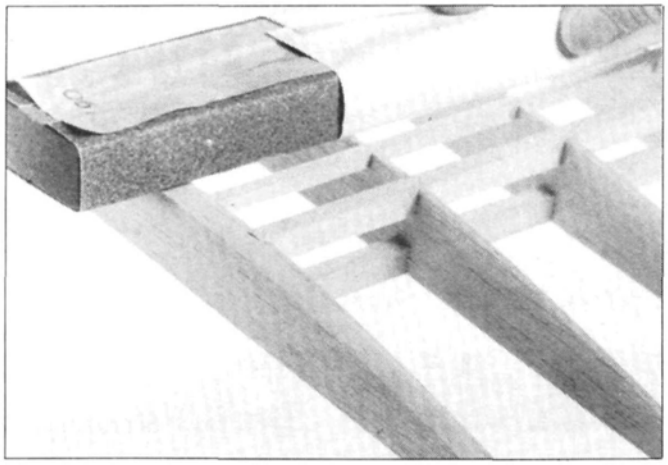
in place. Once again the instructions in the manual were clear and easily understood, with 16 photos illustrating these steps. Other than some trimming needed on the hatch cover to secure a good fit, the fuselage and tail are mostly assembled rather than built.

The manual calls for complete radio installation in the airplane (8 pictures) before the fuselage is finished. This one step eliminates many of the problems beginning builders have with routing pushrods. Once it's fitted and working, the radio is removed for final assembly and sanding, then it's time to build the wing.

Sometime in the past, the designer of the PT-20 must have had the experience of a wing folding in flight. Believe me, he's since made sure that it cannot happen again. The main spars are ¼x⅜ inch spruce and there are two more 3/16-inch spruce turbulator spars at the leading edge. The leading edge itself is ½x⅞-inch, and the trailing edge is ⅜x1½-inch



A ruggedly-built design, PT-20 is also lightweight.



Use of a sanding block enables uniformity of rib sections.

balsa. The trailing edge is extra wide so ailerons can be cut into them if you want. When the three ⅛-inch plywood dihedral braces and center-section sheeting is applied, this wing would support foot traffic across a small river!

The notches in the leading and trailing edges don't exactly match the plan, but since there are lefts and rights to match the wing panels, there's no problem and everything comes out fine at the tips. The wing builds easily and the ribs and spars fit snugly at all joints, so the thin cyanoacrylate glues work well. I was able to build both wing halves in less than 20 minutes. In fact, assembly of the whole airplane, prior to covering, took less than seven hours, including the final sanding. The instruction manual has 21 pictures illustrating wing construction with an additional 17 outlining aileron installation.

Before covering the wing, balance it along the centerline. Mine required almost ½ ounce of weight in the right tip to bring it into balance. An airplane with a heavy wing can never be trimmed properly.

Top Flite's* MonoKote is the preferred covering material and goes on with little difficulty. When covering sheeted surfaces, I use a travel iron covered by a piece of cotton cloth, which helps eliminate the bubbles that form between the MonoKote and the wood. The same arrangement works well for ironing on trim. The area inside the cowl should be painted with a matching fuel-proof paint to seal the edges of the MonoKote and protect the wood.

Since the radio, engine, and landing gear installations have already been done once, their reinstallation offers no problem. When everything is together and tested, it's time to go flying.

FLYING. The PT-20 and the O.S. 20 FP combine to form a matched pair. If they weren't designed to complement each other, they should have been! The new FP series of engines has power in reserve and the PT-20 maintains solid, stable flight on less than half-throttle, which is a good power setting for training. There's an abundance of power available for aerobatics when the student is ready.

Like most rudder-elevator airplanes, there's a little "tail wag" when rudder control is given at low speed, but the wash-out in the tips (outlined in the manual) keeps snapping problems well in hand. The combination of down-thrust and positive incidence in the wing causes a decided nose-up tendency when the throttle is rapidly retarded. That can be irritating to a seasoned pilot, but to a panicked student whose airplane is a spiraling silhouette, it could be salvation!

Once the trick of easing the throttle back is acquired, the landings become automatic and once on the ground steering is positive and smooth. This is a solid, gentle airplane in the air and on the ground.

I made every effort to build the airplane following the plans and instructions exactly, but there were a couple things I just had to change. First, I sheeted the top of the wing at the center section and added a 6-inch length of 1/16-inch wire, bent to the dihedral angle, to the trailing edge to protect it from the rubber bands that hold the wing to the fuselage. I trimmed 1/16-inch from the top of the center ribs so the sheet would lay flat with the airfoil. It would probably be fine without the sheet as shown, but I just couldn't expose bare MonoKote to vibrating rubber bands!

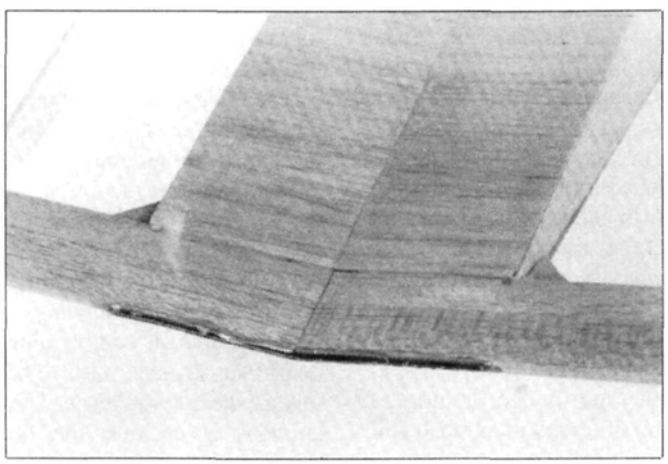
Second, the kit provides ¼-inch hardwood dowels for pushrods to the elevator and rudder; I used ¼-inch square balsa instead. I'm dead set against adding unnecessary weight to the tail of any airplane.

All and all the PT-20 is an inexpensive way to get your feet wet building and flying R/C airplanes. It offers excellent instructions that will start the new modeler on the right track.

**The following are the addresses of the companies mentioned in this article:*

Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.

Top Flite Models, Inc., 2635 S. Wabash Ave., Chicago, IL 60616. ■



Piano wire at base of wing prevents damage by rubber bands.

CONTROLS

Basics of Radio Control

by RANDY RANDOLPH

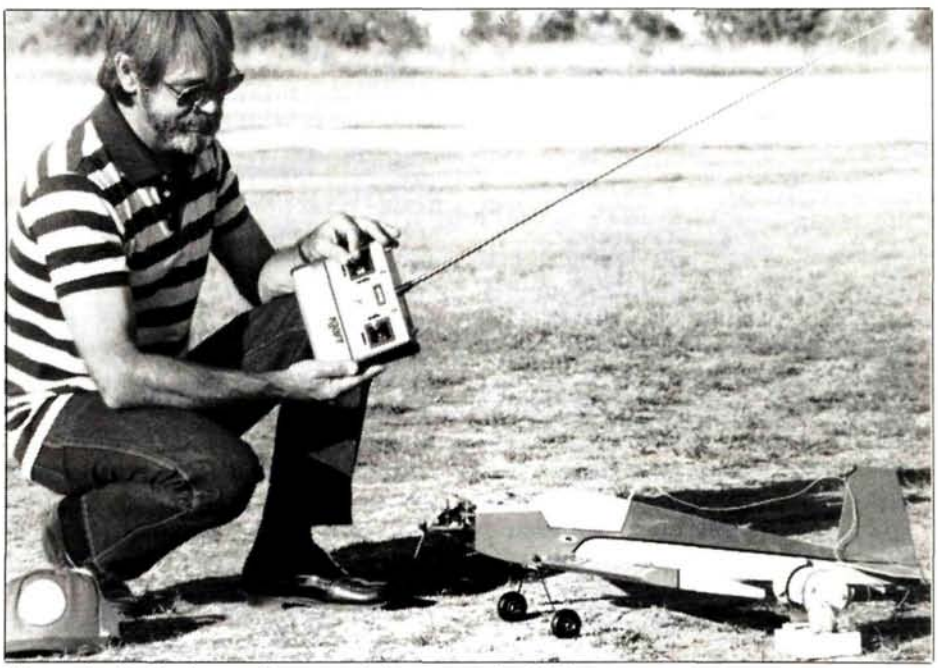
Over the past few months we've covered how the radio makes the controls work. Now let's proceed to what happens when they do!

An airplane operates in three dimensions—up, down, and sideways. Actually, there is one other dimension usually not mentioned as such—*time*, or by another name, speed. Textbooks describe aircraft controls as those which effect the pitch (elevator), roll (aileron), yaw (rudder), and power (throttle). Let's see what these controls do to our airplanes. In this discussion we'll assume that the transmitter is configured such that the elevator and aileron are controlled by the right-hand stick and the rudder and throttle by the left. All airplane controls interact.

The elevator controls the speed of the airplane. When the elevator control stick on the transmitter is moved back, the elevator on the airplane goes up. When this happens, the nose of the airplane goes up, increasing the angle and the wing attacks the air, causing more drag (and lift); and, as a result, the airplane slows down.

The throttle controls the altitude of the plane. Given the above description, if no other changes are made the airplane will zoom up to a slightly higher altitude as the speed decreases, then settle into a nose-high flight attitude at a lower speed. However, if the throttle is advanced, the airplane will continue to climb at the same speed as before. The additional power overcomes the drag caused by the higher angle of attack (higher lift) the wing has assumed.

Conversely, when the power is reduced (throttle stick back) the elevator must be pushed forward (down elevator) to maintain speed and the airplane descends. Landings are made by reducing power, allowing the airplane to descend, then adding back-stick (up elevator) to reduce speed as the airplane nears the ground.

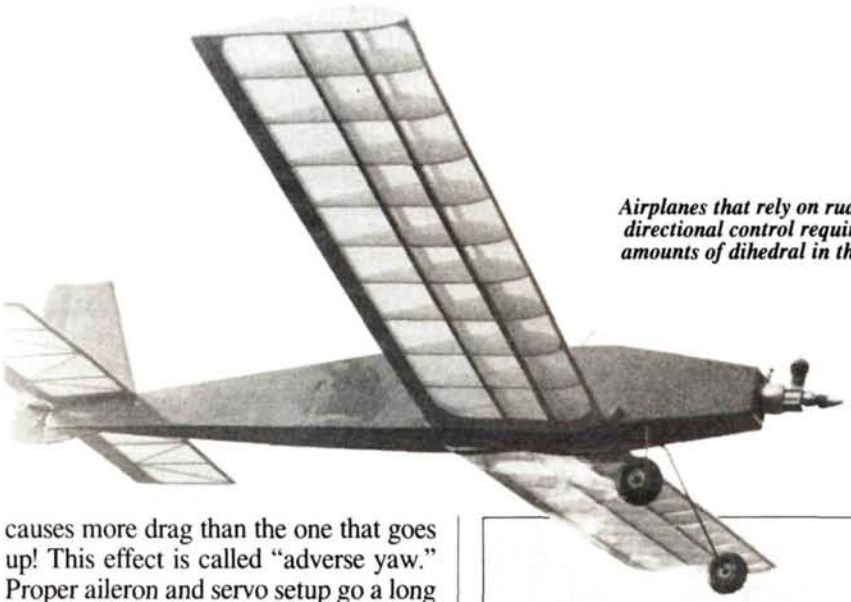


Always double-check control response before attempting flight.

When rudder control alone is given, the airplane tries to slew or skid around instead of banking smoothly. The rudder works the same as the elevator except in a horizontal direction; the rudder goes left, the nose goes left, and so on. When the rudder moves, the flight path tends to remain straight even though the nose is now pointed in a different direction. It will continue to slip sideways unless there is enough dihedral in the wings to cause the forwardmost wing to generate more lift and initiate a bank.

The aileron doesn't work the same as the elevator and rudder, for when one goes up, the other goes down. The down-aileron causes a change in the airfoil of the wing and generates more lift on that side. The up-aileron causes the other wing to lose lift, so the airplane banks toward the up-aileron wing.

When aileron control alone is given, before the airplane starts to bank, it yaws toward the down-aileron. The reason this happens is because the down-aileron



Airplanes that rely on rudder for directional control require large amounts of dihedral in the wing.

causes more drag than the one that goes up! This effect is called "adverse yaw." Proper aileron and servo setup go a long way to reduce this effect, and only the very large models require coordinated rudder and aileron control, that is, left aileron and left rudder at the same time.

Now let's see how to make a turn! There's no difference in the procedure whether the airplane uses three or four channels for control. In the three-channel airplanes the rudder works in conjunction with the wing dihedral to produce the turn very similar to the ailerons in a four-channel bird. Remember we said earlier that all controls interact so in a turn there is more than one directional movement of the stick.

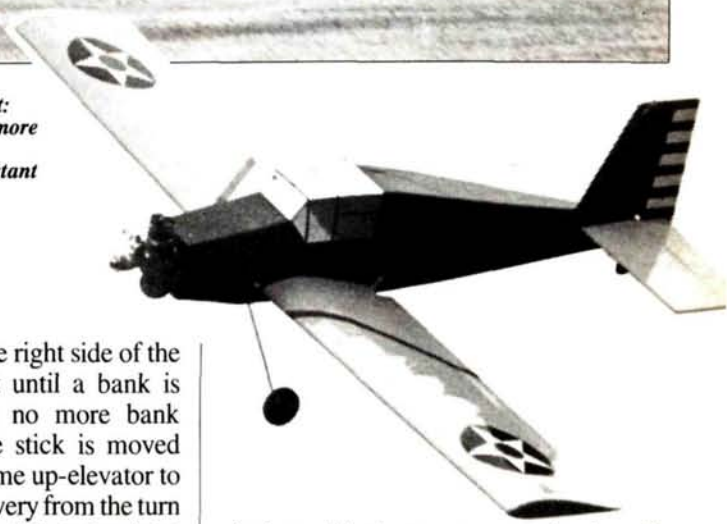
The first step is to establish a bank angle. In a left turn, this means that the left wing is slanted down while the right wing goes up. Because there now is less lift supporting the airplane against gravity, it's necessary to increase the angle of attack of the wing to overcome this loss of lift. Once these parameters are established, the airplane will remain in a banked turn at the same altitude until acted upon by an outside force or given another control.

To recover from a turn, the wings must be brought back level; and because the lift is now directed up, instead of at an angle, the additional lift is no longer required, so the angle of attack must be reduced.

In practice, a left turn is performed by moving the stick (on the right side of the transmitter) to the left until a bank is achieved. Then, since no more bank angle is necessary, the stick is moved slightly back adding some up-elevator to maintain altitude. Recovery from the turn is made by moving the stick to the right, leveling the wings, and releasing the back-stick so the airplane can regain level flight.

Let's look at the top of the stick while executing a left turn. It moves in an arc from center straight, left, then around and back, on around right then forward and, finally, straight back to the center. A right turn would be executed in the same manner but would start by moving the stick right then back and around to the left, finally arriving at neutral center.

When flying, it becomes one smooth movement and the pilot hardly realizes he's moving the stick; his thought is on the airplane. Airplanes are very dumb and stubborn. They must be *forced* to do what you want them to do.



Above: Elevator controls the speed on descent. Right: The steeper the bank, the more elevator and power are necessary to maintain constant altitude.

Randy Randolph, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

PIPE DREAM

by ART SCHROEDER

THROUGHOUT aviation history, certain airframe designs have come along that give truth to the statement "form follows function." Certainly the Wright Flyer and other early designs were highly functional with no extraneous items or much styling in their layouts. Early lightplanes continued the concept of simplicity, as did many WW I fighters. Today's ultralights carry form and function to a very logical conclusion—there's nothing in these machines that's not necessary to sustain flight with an on-board pilot.

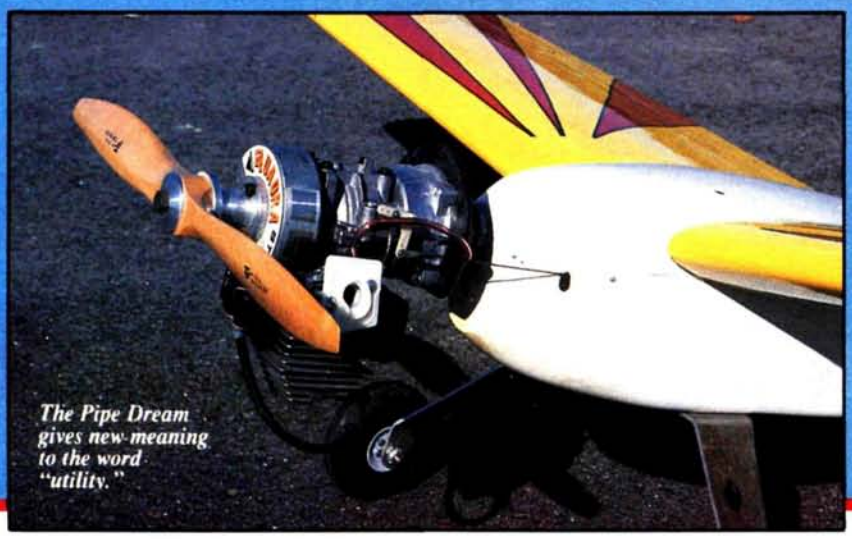
Model aviation is filled with functional approaches to design. In radio control, Hal deBolt's early Live Wire airplanes were classic, no-frills, practical designs. R/C trainers in general have tended to be simple, easily built and repaired airframes over the years. The "form follows function" approach to trainer design makes sense. Why, after all, have fancy, sleek, hard-to-build shapes when an airplane is destined to be crashed many times in a learning effort? Certainly, streamlining has little value in a trainer.

While a simple design approach doesn't usually provide a sleek appearance, to some, functional things have a beauty all their own. A good example is the feeling some of us have for the World War II Jeep—so ugly it was beautiful. The Piper Cub is another example of man's most functional design efforts.

Just as the ultralights have brought functional design to a fine art in full-scale aviation, Byron Originals* has done the same thing in modeling with their latest kit, Pipe Dream.

Pipe Dream has only 20 parts (not counting nuts/bolts and other hardware), and most of these parts are finished and ready to go. Consequently, no more than eight to ten hours are required from box to flight line; a bit more if you opt for ailerons and flaps.

That's the beauty of Pipe Dream; it can be built for rudder, elevator, and throttle control or "full house." It has a fully adjustable wing-mount position to accommodate CG position to a variety of engine sizes (and weights) up front. Indeed, Pipe Dream will fly well with as little as .60 size, two-cycle engines or .90 four-cycles or (best choice) 2.1 cubic inch chainsaw engines. The Quadra 35 (or 40) is a recommended power source. Along with a variable CG comes an adjustable dihedral angle to accommodate the use of ailerons or only rudder flying. Given all this, Pipe Dream becomes a versatile machine, permitting you to adapt a variety of engines and experiment with a variety of control modes. A spacious equipment pod permits easy installation of any equipment you might wish to use. This mix and match capa-bility makes Pipe Dream an ideal test-bed for engines and equipment. It's



The Pipe Dream gives new meaning to the word "utility."

Type: *Trainer Sport*
Wingspan: 83 inches
Length: *58 inches*
Weight: *10 to 14 pounds*
Engine: *Q35*
Wing Area: *1,080 square inches*
Channels: *3 or 4*

Byron's new kit can be a laboratory on wings or a fun-flier's delight!

a model type we've needed for years.

Pipe Dream doesn't end with its versatility—it's also a fine, easy-flying trainer in its rudder version and a super-maneuverable airplane in its aileron version. One almost can't miss with this latest Byron offering; if you don't like one style of flying, you can simply change it.

Pipe Dream is a big airplane, make no mistake. It has a 58-inch length overall and an 83-inch wingspan. It handles big engines very well and thereby becomes ideal for the testing mode I spoke of. There are few airplanes we can risk to try out that latest chainsaw engine; with Pipe Dream we can. We can also train newcomers to giant aircraft without risking the multi-hour airplanes to which we are so attached.

The airplane is based on a 48x1-inch aluminum pipe that constitutes its "fuselage." Now that is as minimal and practical as one can get. After all, the fuselage only holds wing, stabilizer, and motor in proper relationship; so why fuss? Attached to this pipe are two aluminum fittings that hold wing attachment brackets and, at their base, an R/C equipment tray and landing gear. The typical Byron engine mount bolts to a knurled section on the pipe's front end. A plastic pod encloses equipment and tank while giving the whole thing some shape and style.

At the tail end, a brass tube and a few wooden dowels that fit appropriate holes in the aluminum pipe provide support and alignment for the tailfeathers. Wings are molded of the tough-and-proven Byrofoam with aluminum spars already set in place. Wings can be painted with compatible finishing material or covered with low-temp heat-shrink plastics or fabric. The elevator/stabilizer are also of Byrofoam, while the fin/rudder is made of balsa sheet.

A clear and comprehensive instruction booklet makes assembly easy for even the most novice of modelers. It's really hard to go wrong in assembling Pipe Dream. If you hate to read, follow the photos, which provide all you'll need to get this bird into the air.

While there is little I can add to the instructions, I do suggest you build-in the ailerons as shown in the instruction booklet. This adds to the assembly time, but they're there when you want them. Ailerons can be

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Giant Steps

by DICK PHILLIPS

A RECENT AMA ruling has caused concern on the part of some model builders and some members of the International Miniature Aircraft Association (IMAA).

The ruling states that, in the future, no event which allows the flying of models over 55 pounds will receive a sanction, and if such a model is flown at a sanctioned event, the sanction is canceled at the time of such flight. If there's no sanction, there's no AMA insurance.

This is pretty stringent action on the part of the AMA and has undoubtedly made some people rather unhappy. Let's take a close look at why this has happened and why the AMA has felt it necessary to take such an action.

Almost everyone has heard of some of the extremely large insurance settlements which have been awarded by the courts in recent years. Anyone injured in almost any way these days sues everyone involved with the accident. For example, in one recent accident involving a model airplane, those named in the suit included the pilot, the sponsoring organization, the AMA, and *every single manufacturer who had made any part of the model!*

Liability insurance costs have skyrocketed in the past few years, in some cases to the extent that they have been raised out of the reach of many. And the AMA is beginning to feel the pinch as well, not to mention the fact that carriers of such insurance are becoming increasingly difficult to find.

The AMA was recently advised, I am told, that if they continue to sanction events that allow the flying of models weighing in excess of 55 pounds, they would risk a crippling liability suit. Why this is so bears looking into.

Some years ago, when large models started to gain popularity, Canada's equivalent to the AMA (the MAAC) decided to establish an upper weight limit for model airplanes. This was arbitrarily set at 55 pounds.

Albert Doerr's J-3 Cub is a ½-scale model that weighs 100 pounds and is illegal for flight according to a recent AMA ruling.

When such models began appearing here, and when the IMAA was first formed, it too chose to follow the Canadian standard and 55 pounds was established as the IMAA's upper limit. Then, when the IMAA became a special interest group within the AMA, they too adopted this quite reasonable limit.

So that's where the 55-pound limit came from. The AMA has this limit listed as being the *maximum* weight of a large model, and the heaviest which may be flown under AMA sanction. The flying of models weighing more than 55 pounds has been allowed in the past so long as certain criteria were observed, and these dealt with distance between spectators and the flight line, for instance. However, when the AMA permits this weight limit to be exceeded, it's breaking its own rules and those of IMAA. It doesn't take much imagination to guess what would happen in a court of law if a clever litigation lawyer got his hands on that information and was after a settlement for a client who had been injured by a model airplane weighing over 55 pounds, flown at a sanctioned event! He'd be rubbing his hands in glee at having been presented with a sure thing.

I can hear the lawyer now, telling the judge "my client was injured by a large model which was being flown against AMA's own rules at an AMA-sanctioned event, surely, your honor, a case of blatant negligence and irresponsible action." That should provide a fairly hefty settlement. And who pays? AMA's insurance and, therefore, you and I—because that insurance is going to cost a lot more next year.

I believe the AMA's ruling was inevitable and the few who deny it are living in never-never land. It had to come—if not sooner, then later. It was the only thing AMA could do.

It has been suggested to me as IMAA president that IMAA seek its own insurance carrier and provide insurance to those who wish to fly models weighing in excess of 55 pounds. I disagree for this reason; there *might* be 20 or 30 people

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Doerr's Cub, although a remarkable example of this modeler's workmanship, will find legal flight a rarity.

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who fly such models. Why should the majority pay for them to enjoy the flying models which are outside the weight limit? A weight limit, incidentally, which *we chose for ourselves.* It wasn't foisted off on us from somewhere else, *we chose it!* When you consider that there are close to 4,000 IMAA members, and that the insurance premium would be substantial, and only a handful would benefit, well, it just doesn't make sense that the general membership should pay an additional premium for the benefit of a very few people.

It has also been said that many builders of larger models carry additional insurance of their own, and this is true, I'm sure. They certainly will do so if they have any sense at all. That's all well and good, but do you suppose that clever lawyer I mentioned before *isn't* going to sue the AMA, the IMAA, and everyone else just because good old Joe Blow has extra insurance? Don't you believe it. He's still going to sue everyone, and the AMA and IMAA will be just as liable as if Joe had no insurance at all.

Now, I'm no more anxious than anyone else to see additional regulation. We already have more than enough of "Big Brother" as it is. But I suspect we'd have had some more regulation had there been an accident involving one of these large models while flying under our sanction. I think the AMA ruling is correct, I suspect it was inevitable, and I'm sure we're better off with it than without it.

Oh, you'll hear a few screams of anguish, of course. There'll be a few who object to their rights being infringed upon. (Most probably from those who neither build nor fly.) And there'll be some vocal builders of extremely large models who'll have an ax to grind and who'll complain that they can't fly any more. That's not true, of course; they can still fly, they just can't fly in front of the crowds who attend sanctioned events such as the IMAA Annual Festival (and others).

I regret that I won't be able to see such monsters fly. Like anyone else, I enjoy watching the fruit of an experienced builder's labor. I've seen Bob Campbell fly a couple of his biggies and I watched Arlie Klein fly his big Stinson Tri-motor. I'll miss seeing them flown. They're gorgeous, but I'm not so blind or unknowing as to be unable to understand why I won't be able to watch them at public events in the future.

The IMAA has other standards on models flown. These cover engines of over 5.3 cubic inch displacement, wing loading exceeding 48 ounces per square foot, and others. The AMA is not concerned with these limits and has placed the restriction *only* on those models weighing over 55 pounds.

I try to stay off the soap box in this column, but it was suggested to me by the editor that this situation affects the hobby and is of interest to many of you. I hope you understand that I'm not acting as an apologist for the AMA; they can handle their own problems, I'm sure. I believe that the opinions I express above are accurate and reasonable. They do not necessarily agree with the opinions of the Board of Directors or officials of IMAA, although I do know that at least some of the Board do agree with the position as expressed above, though some do not.

Dick Phillips, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

Editors Note: *In 1958 I saw a control-line Class C speed ship break its lines while the airplane was traveling over 120 mph. The airplane passed through a chain-link fence, two automobiles, and imbedded itself 6-inches in an oak tree. Was this airplane less dangerous than a half-scale Cub flying at 40 mph? I saw a Formula I pylon racer go out of control and make its way through a layer of concrete blocks and 2 sheets of 3/4-inch plywood. Was this airplane any less dangerous? As for me, I would much rather be given the opportunity to dodge that big Cub than I would either one of the latter. In addition, the Formula I and the control-line speed ship offer much more potential to damage or injury, for the obvious reasons mentioned.*

The 55-pound weight limit, in my opinion, is ill-founded without establishing a wing loading limit for all flying objects. It is not the size that does the damage, it is the kinetic energy behind it. *DBS*■

Radio-Control

by ART SCHROEDER

EVERY SO often, an item in this column generates a lot of enthusiasm. Just such an item was a piece in the May '86 issue about the value and virtues of an R/C Payload event. I initially saw the possible event with a relatively simple "weight carried over a timed course" scoring basis, wing area limitations, and .15 size engines. Some of you agreed, some did not; but all agreed weight-lifting would present a new R/C challenge that would stimulate a lot of interest and new aircraft design.

Steve Woodruff of Kent, Washington, envisions a relatively simple event for weight-lifting and says:

"I've just reread your comments about an R/C payload event and I find the idea stimulating. I agree that rules should be kept to a minimum. In that vein, I think a wing area limit is unnecessary. Structural strength and weight constraints combined with aerodynamics would result in a natural point of diminishing returns for wing area. I do, however, think a .15 size engine is too small. Unlike free flights, the radio gear alone (five or six channels will be needed for optimum performance) takes up a substantial portion of the potential payload of a .15-powered airplane. I think .40 power would permit a greater range of experimentation.

"I would propose the following:

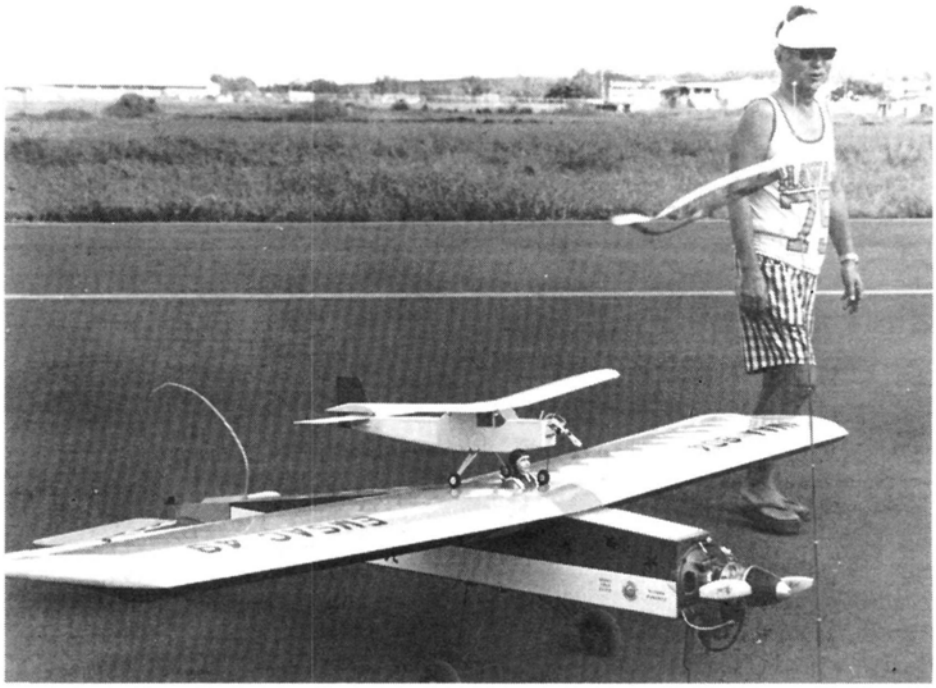
"1. Only stock Fox .40s with factory muffler and 5% to 10% fuel. This event should encourage experiments in aircraft design; not the spending of mega-bucks for hot-rod engines. The K&B 40 would be another good choice.

"2. There could be as many as four classes: .40, twin .40s, diesel .40s, and four-stroke .40s.

"3. Successful flight would require a takeoff, climb to 20 feet (or some other minimum altitude), figure 8, approach pattern, landing, and taxi-in.

"4. The score could be simply the payload weight in ounces or a combination of the payload weight and a ratio of gross and payload weights.

"I hope enough interest is generated by your comments to create a payload event and the thought just came to me that there might be enough room in a payload event to break out scale and non-scale categories."



Will a PAA-type payload event work with R/C? The question is raised herein. What do you think?

Ted Winston of the Simi Valley Flyers of Burbank, California, has obviously given the event a lot of thought:

"An R/C weight event is just what we need! The following are my thoughts on the subject:

"A good weight event should reflect modern thinking. It should not stress large-wing-spread models which just lug along with the engine at full throttle. This is what killed the [old free flight] PAA-Load event. It should, instead, demand fast, well constructed and maneuverable models.

"I would have an event I would call the 'Air Express Event.' It would stress delivering the maximum weight over a given course at an average speed of at least 60 mph with a given stock size engine.

"Two pylons would be placed 100 yards apart on the flying field. The participant would take off and fly 20 figure 8 laps about the pylon. He would be required to complete the course in less than 2 minutes and 16 seconds from the start of the takeoff run to touchdown. He would then be required to taxi to a marked area, called the 'terminal,' at the

"You've got to be kidding," says Dave Scully about Art's proposal, as engine man Harry Roe tweaks his engine.

side of the runway. The cargo would consist of wooden or plastic cubes, 1 inch on a side, that would not weigh more than ⅓ ounce. The contestant would load up his plane with as many 'express packages' (cubes) as he may choose. He must place those packages in not more than two cargo areas in his airplane. At the end of a successful flight, his packages would be weighed. The contestant with the most cargo weight wins.

"Explanations:

"1. A given displacement and stock engine would be a requirement. *(Apparently the .40 engine would be best—AFS)* With the size of the engine the only design restriction, we can expect a wide variety of designs to emerge. This will help in maintaining interest in the event. It should also encourage experimentation in props and fuel mixtures. A stock engine will not penalize modelers without machine shop facilities.

"2. Figure 8 laps will insure that the planes will be agile. This will maintain interest in the event where we don't want 'luggers.'

"3. The 100 yards between pylons is a rather short spacing and will help insure airplane agility. It will also demand pilot skill with a turn coming up about every 3 seconds. It will also require skill to make sharp turns about the pylons with a heavy ship without stalling. *(The minimal spacing will also keep the "footprint" of the event in a limited space, thereby keeping noise dispersal to a minimum—AFS)*

"4. To average 60 mph over the full course, speeds of over 70 mph will have to be maintained. At these speeds, streamlining has some effect on performance and this should result in good-looking, sleek airplanes.

"5. Time starting at the beginning of the takeoff roll will prevent extra long takeoff runs.

"6. By requiring a taxi to terminal, intentional crash landings will be eliminated.

"7. The small 1-inch cubes will represent small 'Overnight Delivery' real-life air express packages. *(Hey, this would be a natural sponsorship for Federal or Percolator, uh, Prestolator, uh, Purolator!—AFS)*

"8. By limiting the weight of a cube to

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ENYA VT-240

(Continued from page 49)

best suited to a model of a cowled radial engined prototype. As the data table shows, the engine measures 110 mm (4.33 in.) from its crankshaft axis to the top of its valve rocker-box cover. Allowing for clearance between the cowl and the corners of the rocker covers, the VT-240 would fit within a 9-inch diameter radial cowl.

The VT-240 has the same bore and stroke as the 20cc single cylinder Enya four-strokes, i.e., the standard 120-4C and the more powerful R120-4C, so it is no surprise to find that it uses the same cylinder-liners, pistons, rings and wrist-pins as the standard 120-4C. It does not use any components from the R120-4C, apart from its pushrod tubes and inlet/exhaust pipe fittings. A few parts from other Enya engines are also utilized.

The VT-240 has a pentagonal section crankcase to which the cylinders are attached at an included angle of 80 degrees, making a slightly narrower engine than the 90-degree layout more commonly used for vee-twins (and, incidentally, for V8 automobile engines). The 120-4C steel cylinder sleeves are encased in separate finned jackets that are secured to the crankcase with studs and nuts. The cylinders are slightly staggered on the crankcase, since the two conrods are placed one behind the other on the crankpin instead of using a fork-and-blade arrangement.

The cylinder heads are new. These were necessary in order to provide symmetrical port angles with the inlet pipes placed centrally and the exhaust pipes to the outside. Each cylinder has its own Enya G-Type carburetor. These, made in mirror-image pairs, are mounted side-by-side on a bracket at the rear with short chrome-plated inlet pipes leading up to the cylinder heads. The two throttle arms are coupled together to provide for a common linkage to the throttle servo, but each carb has its own needle-valve and airbleed screw to enable mixture to be precisely adjusted to the requirements of its cylinder.

The single-throw overhung crankshaft is supported in two ball journal bearings contained in a bolt-on pressure-cast front housing. Conventional Enya practice is followed with the camshaft drive. The crankpin-driven rear timing-shaft turns separate inlet and exhaust camshafts through spur gears, the only difference being that the camshafts are mounted one above the other, instead of side-by-side,

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ENYA VT-240

(Continued from page 74)

and each has two cams instead of one.

The Enya VT-240 is supplied with a black painted cast aluminum firewall mount. This attaches to four crankcase lugs, each of which is tapped M5x0.8 (metric), with hexagon socket head cap screws. Also supplied are two glowplug leads with tight-fitting connectors, plus a ground lead, to enable starting current to be picked up at a single strategically placed point.

The maker's recommended prop sizes for the VT-240 include 16-inch diameter by 10 to 12 inches pitch, 18-inch diameter of 8 to 11 inches pitch and 20-inch diameter of 8 to 10 inches pitch. Practical speed range is quoted as 6,000 to 11,000 rpm and the claimed maximum power output is a healthy 3.2 bhp at 10,500 rpm.

Peter Chinn, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

STRIKING BACK

(Continued from page 22)

p.m., when the formal air show got under way. After the show, model-flying took place until dusk. It was a three-day giant-scale binge witnessed by over 30,000 spectators.

After all the flying, some airplanes and pilots stood out as exceptional. One of those was a Gee Bee Model Z as flown by Terry Majewski and built by Don Neill, both of Lincoln, Nebraska, Sky Knights. Always perceived by modelers as a difficult subject, Neill and Majewski proved the Gee Bee was easy to fly. The model was built-up from a doubling of Granger Williams' plans and powered by a Sachs 3.7. It showed all the qualities of the original—it was fast and positive. The bird weighed 32 pounds, had an 8-foot wingspan and was painted with Pittsburg alkyd enamel. There wasn't an eye not on the Gee Bee each time it flew, and with good reason: from takeoff to landing this was an astonishing airplane. It won the Best Civilian Award at this Byron bash.

So, too, was Bob Huisinga's Fairchild F-24W. This classic oldie was powered with a Q-50 on a 109-inch wing carrying 28 pounds. Not yet fully detailed, it was still beautifully done and when finished will be a stunning achievement.

For me, the best model-flying at the show was done by Billy Hiller with a Byron Originals' Pitts Special. This was a sample of Byron's first kit that knocked the socks off of R/C modelers some seven or eight years ago. At the time, it was hard to imagine an all-foam, 1/3-scale Pitts powered by a .60 engine—impossible, unbelievable, impracticable, and crazy! Well, it did work as the years have shown; and as I know after building six of them. Of course we eventually used chainsaw engines in those early Byron Pitts airplanes and the airplane proved capable of handling the big bangers as well as the original 60 Byrodrive. That airplane has lasted all these years—it's still one of the most popular Byron kits—and was certainly a force in popularizing big aircraft.

As flown by Billy Hiller, the airplane was stock with a piped, OS Max 60 FSR on Byrodrive driving an 18x12 propeller. It was unremarkable until Hiller lifted it off. In its element, the red Pitts took on a whole new character; all maneuvers plus spectacular, low-level knife edge, controlled snaps, point rolls and spins I found hard to believe even after long experience with this airplane. This was Byroflying at its best! Billy didn't win any prizes but he sure made many of us oldtimers rethink the original Byron approach!

Last year, J.W. Jones wooed the crowd with a Byron P-47 flown by Ted White. If ever anyone needed positive proof of Byron's warbirds' flight capability, it was provided by those flights. Indeed, it was 1985 Fun Fly's Best of Show. In 1986, J.W. Jones returned with his P-47 and did his own flying with similar results. He won Best Military. J.W. is not only a fine builder, but he can fly them, too. One might think J.W. would be content with that. Not so, he once again took Best of Show with a new Fleet biplane. Ida Grove has *got* to be J.W. Jones' Disneyland!

Not to be outdone, Walt Moucha of Balsa USA came with his Citabria Pro powered by a Quadra 82. This 10-foot beauty sported a Coverite covering and a gleaming red-and-white DuPont acrylic enamel finish. Walt demonstrated his scratch-built bird to its fullest, often belying its 35-pound weight. Unfortunately, shortly after the Byron affair, Walt suffered a tragic fire at his home in which

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STRIKING BACK

(Continued from page 76)

this fine example of modeler's art was lost. But I'm sure another example of Walt's achievements will fly again.

Over the years, one of my favorite scale-modelers has been Bud Atkinson. His ability to develop scale projects that are buildable by most any modeler are nearly legend. I need only cite the Ace kit of Bud's T-34; anyone can build a fine, flyable scale model from that kit. This year at Ida Grove was no exception. Bud showed up with a Northrop A-17—a fine presentation that appears to be in the arena for all modelers. This bird spans 92 inches and is powered with a Zenoah G-38. It sports flaps, a K&B epoxy finish and foam built-up construction. Certainly it is an unusual but highly practical giant-scale project. Such has been true of all Bud Atkinson airplanes.

There was another giant-scale airplane flying around with the Ida Grove airfield. This one was Steve Grey's DH-86B on four OS 20 engines. At 96 inches and weighing 13 pounds, it was hard to believe as little as .20-power could do the job. Simply a case of dividing 80 c.i. of power into 4 .20-power discs. The classic airplane flew slowly and stately. It is a vivid Ida Grove memory.

This was, of course, a Byron show and a high percentage of airplanes flown were from Byron kits. It seems fair. There was the usual collection of Pitts, Eagles and warbirds. An unusual one caught my eye. At the show's start, one of the Byron tents had as its feature the construction of and discussion about the Pipe Dream and the 1/3-scale Glasair. Both were flown before the weekend was over, but the Glasair was very entertaining. It was flown without any finishing and by all comers who had purchased a Glasair at the show! It was weird to see that Glasair in its natural, translucent green, fiberglass-finish, and white unfinished wings. If one looked closely, Glasair's innards were visible through the fuselage sides. And it was seen often, it seems, because Glasair sales were brisk.

After each day's flying, the Byron airshow entered center stage. Opening the affair were skydivers from the local area. Those skydivers were exceptional and even offered a two-person dive for any interested party with a special dual-parachute. One taker was Dean Copeland, Byron's lead model-show pilot. He said the experience was great. I'm sure it was but I still can't see myself leaving, voluntarily, a perfectly good airplane.

The skydivers made a great opening that was followed by the never-to-be-forgotten Christen Eagles. That performance was astounding! Three little biplanes with an unmistakable color scheme, performed multiple passes and group maneuvers that left the crowd breathless. Gene Soucy, Tom Poberenzy and Charly Hilliard knew what was going on at every instant. I won't try to describe the Eagles' performance. I can only say that seeing them is seeing the best. I hope Byron's extravaganza includes the Eagles for years to come.

The very same flyers, with Charly Hilliard at the controls, put on the best J-3 Cub comedy routine I've ever seen. It included a vintage car, lots of running around and Clark Kent. Unfortunately, Superman didn't come along—but that's another story.

Each afternoon came the *piece de resistance.* Striking Back, once again, is a show that all modelers must see. There simply isn't anything else like it. It's a Byron original!

On display was Byron's latest 1/5-scale airplane, which dwarfed even the huge B-25s and C-47 that are regular perform-

(Continued on page 82)

STRIKING BACK

(Continued from page 79)

ers in Striking Back. This, the 28-foot 9-inch B-29. All hoped the 383-pound (powered by four special Quadra 100 engines) bird would be flown but safety considerations held off the flight. A sensible decision, since a place crowded with over 15,000 people is no place for flight-tests. However, taxi tests were run and that was impressive enough for most. I've seen most of giant-scale's renowned projects—but never anything like this. The power and fury of 4-gear-driven, 38-inch, 4-bladed props could easily be seen and heard. In fact, in high-speed taxi, this huge bird was ready to fly! Soon it will, and I'll report on this next month.

I'm sure all readers by now are under the impression that I really liked the Byron Fun Fly. I did! In fact, if I were a theatrical show reviewer I'd surely give this affair 5 stars; it's just that good. Why not come and see if I'm right in 1987. You'll really enjoy this one, which will be billed as Aviation Expo '87. Next year the giants, jets, and full-scale, along with an all-new Byron 1/5-scale Airforce show, will be combined from August 12 to 16 in one mammoth show. I'm going to be there and I hope to see you there!

Somewhere in the South Pacific (MAN)—Several days after a conclusive action destroying a main enemy base, America's newest aeronautical weapon took to the skies. This, the Boeing B-29, the biggest bomber man has seen. The aircraft was flown under the command of recently promoted General G with Captain Bryan at the controls. Flight was from I.G. base and was flawless. These will prove to be the wings to soon Strike Back at the enemy homeland. Details to follow.

The following is the name of the company highlighted in this article:

Byron Originals, P.O. Box 279, Ida Grove, IA 51445. ■

PIPE DREAM

(Continued from page 65)

locked in neutral position when Pipe Dream is flown as a rudder airplane. I built-in the flaps following typical Byron practice (the wings are really from their fine Glassair offering) and I suggest you do this as well since it gives you an additional control mode with which to practice. I actually built two sets of wings,

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PIPE DREAM

(Continued from page 82)

but the photos only show the trainer, rudder-control version.

As a trainer the Pipe Dream really sparkles. It has soft flying qualities that should suit any beginner; particularly when the services of a training pilot are used. In its training arrangement, Pipe Dream is stable and positive. That is to say, it will recover from almost any attitude by simply releasing the control sticks. I must caution that, as an aileron airplane, it has neutral stability, or, it goes where you point it and does not recover without some control input. Pipe Dream is really two airplanes in one; you just pick the one you want!

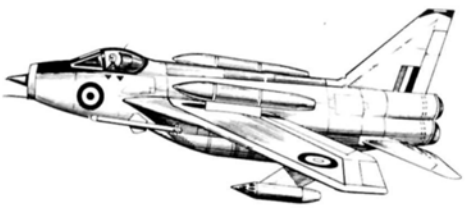
With ailerons, the airplane becomes very maneuverable while still retaining the same softness of the trainer. I could find no nasty snap tendencies; the airplane simply doesn't get "stupid" when slowed down. And with flaps you'll really be able to spot-land Pipe Dream on the proverbial dime.

The airplane is a true, in-line design with wing, stab, and engine sharing a common datum line. The wing is set at 0 degrees while a pre-bent kink in the pipe sets the stabilizer at a couple degrees negative. At the indicated balance point, Pipe Dream is nearly a hands-off flyer in both trainer and "hot-shot" version.

A few notes are in order concerning Pipe Dream construction. When cutting the plastic pod to fit, allow enough opening to avoid direct contact with the pipe. Failing this you can be sure you'll pick up some cracking through vibration. If you set up flaps, an additional tray to hold the flap servo above the regular equipment tray will be needed. A bell-crank system seems the easiest way to actuate flaps to still retain the easy disconnect feature of the split wings but in this area you're on your own. Byron is now recommending a push-pull, closed-loop drive system for rudder control to avoid any rudder flutter exhibited by some early examples of Pipe Dream. Mine had no such problem and continues to fly with only the basic single nyrod. However, the two-rod system is superior and I strongly suggest you incorporate it.

If you use a Quadra 35 (or 40) with the spring starter and its intendent mounting cup, the engine will be 1½ inches farther forward than normal. Even with the pod placed in its most forward position, I required some weight on the stabilizer to balance things. This was solved by employing Prather* self-stick weights on the stabilizer. Normal Quadra mounting does not require this. I suggest you use 5- or 10-minute epoxy for any gluing tasks; it's compatible with foam and gives enough positioning time. The pod can be painted with most hobby paints or can be left a natural white. Test any paints you try on a piece of scrap material.

I used the fine Altech* Simprop 20, FM Security Microcomputer System. This is one radio system that has had considerably more than the usual, perfunctory Field & Bench test. I've used it extensively for well over a year. I continue to use the radio because it has been flawless in performance, has solid servo-response and seems almost immune to any interference it has surely encountered in the New York area. Along with its solid performance are numerous channel-mixing and -reversing features, a tailored



adjustment module, fail-safe, low-voltage warning systems, and other valuable features. I have yet to have a problem, *even with provable on-frequency interference!* This is one radio to which I would trust my most ambitious scale project and it is well worth your consideration.

The Quadra 35, as said earlier, is an ideal power source for Pipe Dream. The engine starts easily (on its spring starter) and is quite smooth for such a big two-cycle engine. It seems to only improve with running time. I'm using a Top Flite* 18x10 prop which seems to give a nice balance between level flight speed and vertical performance.

Pipe Dream's appearance may not appeal to you, but I think it's quite charming in its simplicity. It's an ideal test-bed and warm-up machine as well as a trainer. Frankly, this airplane has given me more satisfaction than many exotic projects I've been involved in. It is rugged (a nice quality considering my occasional "hard" landings) and a fine day-after-day sport flyer! I think you'll find it a great addition to your fleet. I did!

**The following are the addresses of the companies mentioned in this article:*

Byron Originals, P.O. Box 279, Ida Grove, IA 51445.

Prather Products, 1660 Ravenna Ave., Wilmington, CA 90744.

Altech Marketing, Inc., P.O. Box 286, Fords, NJ 08863.

Top Flite Models, Inc., 2635 S. Wabash Ave., Chicago, IL 60616. ■

AEROFOX

(Continued from page 42)

way to where they are joined at the tail. All the bending of the sides is between #F and #G. Clamp a short, straight board to each side to keep them straight while gluing, and until the remainder of the cross-pieces are glued in place. The diagonal bracing at the top of the fuselage is a must to keep the tail rigid. The formers at #G, #H, and #J, and the ⅛x¼-inch stringers are added after the tail surfaces are glued in place.

If the 1/16-inch plywood doublers were glued accurately, the firewall (#A) will fit squarely. The oval opening in the firewall is optional, and is part of a system to make the fuel tank more easily removed. A ⅛-inch-thick plywood plate is screwed to the rear of the firewall behind the oval opening, and the fuel lines connect to straight fittings mounted on the plate. Remove the screws and the plate, and the lines and tank come right out. The ¼x¾-inch pieces are glued to the doublers as a support and a stop for the fuel tank.

Build-up the cabin area between #C and #F, and cut out the curvature of the wing. The balsa windshield is added after the final fitting of the wing.

The elevator and rudder push rods, and the landing gear are installed before planking the underside of the fuselage. If you use the C.B. Associates tail wheel as I did, glue the ⅛-inch plywood plate to the underside of the tail section. Be sure to drill the mounting holes and attach blind nuts on the back side before gluing it in place.

As for the tail, the fin and stabilizer are built on the plan. The ½-inch thickness may seem excessive, but when the Aero-Fox is completed it will look just right. The ½-inch-square spar is sanded to a slight taper, top and bottom. The leading edge is tapered and radiused, producing a pleasing, symmetrical airfoil. The rudder and elevators have a ½-inch-square balsa forward edge, with a ⅛-inch-thick balsa sheet glued to it and centrally located. The ⅛x¼-inch diagonal ribbing is glued to both sides, and because of the airfoil, they will be flush and smooth when sanded. Fit the hinges before any of the tail surfaces are sanded, so it will be easier

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AEROFOX

(Continued from page 86)

to locate the center.

Glue the stabilizer and fin to the fuselage, making sure that they are properly aligned, square and level. There is a third hinge added at the bottom, between the fuselage and the rudder. Quarter-inch triangular stock is used as a fillet between the fin and stabilizer. This also strengthens them. Now add the formers and stringers to the top of the fuselage. The remainder of the fillet is built-up from scrap balsa and sanded carefully.

The wings are built separately right on the plan. The forward lower spar rests on the plan, while the rear spar should be blocked up 1/16 inch. The trailing edge of the common ribs (#3) should be blocked up 1/4 inch. Rib #4 should be glued in place before the tip, laminated from 1/4-inch balsa, is glued in place. Remember, and this applies to rib #4 as well as the rest of the ribs to the tip, align them even with the top surface of the outer ribs, as from rib #4 to the tip, while the top surface is straight; the bottom surface curves up. Use a straightedge laid across three or four of the #3 ribs as a guide, making sure the tip ribs are all in line front and rear. The tip is blocked-up in its proper position, 7/16 inch up at the leading edge, 5/16 inch up at the trailing edge of rib #4, and 13/16 inch at the tip. See the wing details for the method of extending the spars.

When the two wing halves are completed, pin them in their proper location on the plan, with the proper dihedral, and construct the center section. Add only the 1/16-inch balsa sheeting on the bottom of the center section and the 1/16-inch plywood trailing edge, so that the wing can be fitted to the fuselage. When the wing is properly located on the fuselage, using the two 1/4-inch-diameter holes in the plywood bulkhead (#F) as a guide, drill through the leading edge of the center section for the 1/4-inch dowel-locating pins. These are added to the wing and securely glued into place. Now the remainder of the 1/16-inch sheeting can be added and the wing completed. The balsa windshield can be added to the fuselage.

The ailerons and flaps are constructed from 1/8-inch balsa sheet with a 1/2-inch-square forward edge and 1/4-inch-thick ribs. When completed, sand as shown on the plan. The tips of the ailerons must also be curved upwards to match the tips of the wings.

I used a 1/16-inch-thick aluminum plate for mounting the wheel pants; 1/16-inch plywood will probably work just as well.

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AEROFOX

(Continued from page 92)

It is held to the landing gear by the axle, and to keep it from twisting, drill and tap for a #2-56 machine screw as shown on the plan. The Sig Citabria wheel pants come in two pieces, and can be assembled by clamping them together, and as Sig recommends, painting the seam with lacquer thinner. Epoxy the ⅛-inch-thick plywood plate to the inside of the pants for mounting. Position the wheel pants and drill through the aluminum and plywood plates. Add the blind nuts.

The cowling is built-up from ½-inch-thick balsa, and ½-inch triangular stock to reinforce the corners. I inlaid small pine blocks where the mounting screws are located to keep the screws from crushing the balsa. The nose is ¼-inch plywood and turned to the proper diameters, cut in half and glued to the cowling. A lot of careful sanding is required. The lower section mounts to a bracket made of 1/16-inch aluminum and screwed to the bottom of the motor mount. Both sections mount to the firewall with small easily made aluminum angles. The upper section will require some cutting away on the inside to clear the top of the cylinder, the cowling fits so close.

Both of our AeroFoxes are covered with silkspan. The first AeroFox received 10 coats of clear dope, two coats of polyurethane primer, three coats of gloss-white polyurethane enamel, and then whatever grey trim was needed. All of this added about a pound to its weight, bringing the total up to 6½ pounds.

Our second AeroFox got only five coats of clear dope, one coat of gray automotive primer, three coats of automotive acrylic lacquer and what trim was needed. This resulted in a lighter finished aircraft, just under 6 pounds. A plastic film-covering should be lighter still.

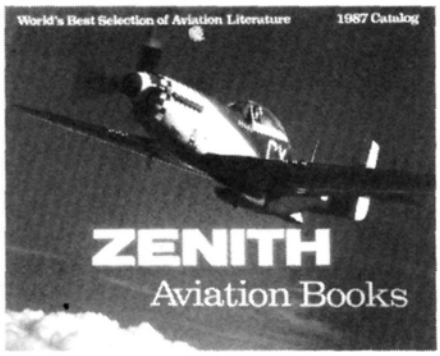
The attractive color scheme of the AeroFox was designed by Scott.

FLYING. The AeroFox is a model with exceptional flight characteristics. On take-off roll, AeroFox, unlike most tail-draggers, can be kept going straight down the runway with only a few gentle corrections of the rudder. Even when trading half throttle for about 10° flaps, AeroFox will gracefully rise from the pavement and climb out. The wheel pants are not a problem on a grass field as long as it's fairly smooth.

There is no better time to appreciate the lines of an AeroFox than when it's in the air, although it may appear to be doing 200 mph just sitting on the flight line. At full throttle its aerodynamics

(Continued on page 102)

Product News



New 1987 Zenith Catalog

Features over 400 new titles, and is one of the largest selections anywhere on ragwings to supersonic spyplanes, video tapes, R/C modeling, aerobatics, and things of general and technical interest. Available from Zenith Aviation Books (P.O. Box 2-Rev, 729 Prospect Ave., Osceola, WI 54020).

1987 R/C Scale Calendar

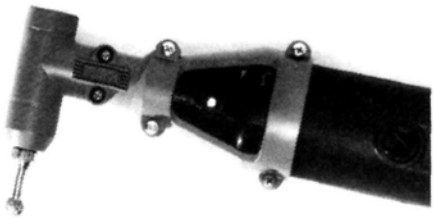
A great gift that features 12 full-color R/C scale aircraft from U.S. and Europe. A caption describes each plane and its builder. For info, contact DC Aviation (P.O. Box 98, Big Rock, IL 60511).

B&D Tool

Now available from Precision Tools of Tulsa (P.O. Box 700518, Tulsa, OK 74170) is the Black & Decker 150-watt Deluxe High-Speed Rotary Tool Kit (Model No. 9805) which contains a high-speed rotary tool (Model No. 9811), a variable-speed electronic power adaptor (Model No. 9821) and 40 assorted accessories packed in a durable kit box. The line of Black & Decker precision power tools consists of 14 tools and kits and over 100 accessories.

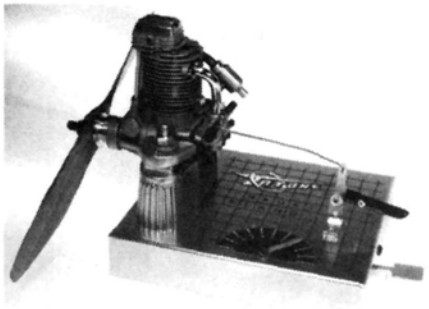
Dalotel Uno

This pattern ship is designed by Hanno Pretner, is made in Austria by Roga Technik, and is a 65-inch wingspan, highly modified pattern ship that uses either a .90 two-stroke or 1.20 four-stroke. For the specs, contact AMS Imports, Inc. (1110 S. Wells Ave., Reno, NV 89502).



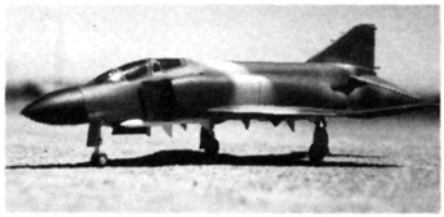
Right Angle Drive

Robart's (310 N. 5th St., St. Charles, IL 60174) new Right Angle Drive for Dremel MotoTools gets you into tight places. Constructed with rugged ABS housing, lifetime-lubed bearings, and hardened PM gears. Easy to use, it can drill, cut, groove, and grind areas not easily accessible. Available at your dealer.



Thrust Tester

Unique, for use with .30 to 1.3 two- and four-cycle engines. Easy to use, and a safety lock prevents movement of the tester when engine is started. Body is formed of heavy aluminum. At leading hobby shops or order direct from Tatone Prods., Corp. (1209 Geneva Ave., San Francisco, CA 94112).



B-Line

A George Miller design for single Byrojet use and Rom-Air retracts. It has a 72-inch fiberglass fuselage and fiberglass duct tube. Foam core wing spans 52 inches. It's a precision scale kit that flies great. All wood in kit. More info from B-Line Products (P.O. Box 1231, Roseville, CA 95661).

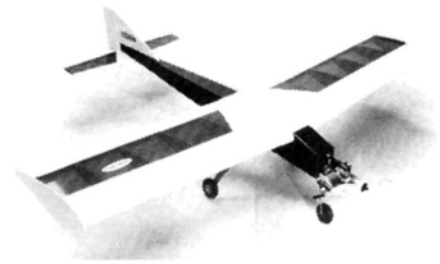
Speed Control and Battery Eliminator

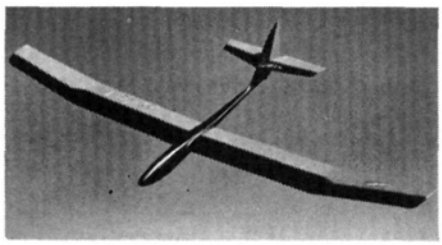
MC109 (MC9)/FET Electronic Speed Control for competition in R/C cars and boats. Features FET (Field Effect Transistor) technology and high capacity/low drain performance in a compact package.

Also, SWH-10/Battery Eliminator Circuit (BEC) switch harness with built-in voltage regulating circuit operates on 7.2V 6-cell, eliminating extra weight of receiver Ni-Cd or batteries. See your local dealer about these from Futaba Corp. of America (555 W. Victoria St., Compton, CA 90220).

Slip It

Slip It arrives featuring outstanding lubricating characteristics for home and hobby use. Use it on anything that sticks! 100,000 uses: nyrods, ball links, gears, axles, suspension parts, hinges, shafts, bearings, swivels, retracts....See it at better hobby shops in the U.S. or from Micro Research, Inc. (P.O. Box 2777, Danbury, CT 06813).





Blue Max II and Prodigy

Prodigy, a two-meter sailplane, is a consistent contest winner with computer-designed Selig airfoil. It has outstanding speed range, L/D and smooth flight. Its wing will withstand many "zoom" launches with carbon-fiber reinforced design. Full-size plans, photos, included as is all hardware. Designed for 2- or 3-channel radio. Simple, lightweight design endows Blue Max, a .40-size sport plane, with outstanding performance in all directions. Stands up to fun flying. Wing tip plates help to slow flight, enabling the plane to land at very low speeds without stalling. Plans with photos, and parts include wood and "alumalite" landing gear with hardware package too. For specifics, contact Off The Ground Models, Inc. (606 W. Anthony Dr., Urbana, IL 61801).

BBC-Stork Helicopter

Newest from Hirobo, comes with O.S. .46 engine and uses the latest R/C helicopter features that include DDF rotor head, tooth belt tail-drive, tricycle landing gear, inline swash plate. GMP will also market an American version that will be sold without an engine—and should be for sale by early 1987. Check for it at your hobby shop, info from Gorham Model Prods. (23961 Craftsman Rd., Calabasas, CA 91302).

Super Hots

The kit features book/plan format, step-by-step illustrations. Completed plane has 54-inch wingspan, 51-inch length, and uses .40-.61 engine. Your dealer has it as kit No. 157. For more info, contact Midwest Prods., Co. (400 S. Indiana St., P.O. Box 564, Hobart, IN 46342).

AEROFOX

(Continued from page 96)

really take over by allowing the model to reach an incredible speed for the size of the engine and weight of the model. At quarter throttle and half flaps, it will motor around like any basic trainer.

It has also proven its aerobatic abilities by cleanly flying through any of the basic or more complex maneuvers, not to mention a few accidental maneuvers that have yet to be named. Sustained inverted flight can easily be achieved with only slight retrimming, and inverted spins are as easy to get out of as letting go of the sticks or applying opposite rudder, whichever you prefer. Although its vertical climb is limited, there is ample thrust to reach a hammer-head or any similar maneuver.

On a windless day, landings may be a little on the quick side and AeroFox may require a little more room to set down, but full flaps and a full-stall landing will limit ground-roll to as little as 30 feet. (Due to the effectiveness of full flaps when landing, it is important to maintain a very controlled, nose-down attitude, using the elevators to control airspeed rather than the throttle.) Even when it's moderately breezy or gusty, AeroFox will penetrate well, and calmly deal with any crosswind landings.

In short, AeroFox is the trainer that takes you from the trainer to?...

The suppliers of the principal components mentioned in this article follow.

World Engines, 8960 Rossash Ave., Cincinatti, OH 45236

For engine mount (No. 200-065): Kraft Systems, Inc., 450 W. California Ave., Vista, CA 92083.

For landing gear (No. L-3): Great Planes Model Mfg. Co., P.O. Box 721, Urbana, IL 61801.

For wheel pants: Citabria, Sig Mfg. Co., Montezuma, IA 50171.

For tailwheel assembly (No. 5510 reg.): C.B. Associates, Inc., 21658 Cloud Way, Hayward, CA 94545. ■

TELSTAR

(Continued from page 45)

who wants to look like a pattern hotshot and it makes into a neat-looking Sunday sport machine. It's also a good practice machine for the active competitor—and that's a lot to expect from one box!

THE KIT. The Royal Telstar 25 comes as a kit of finely finished parts with everything included except glue (and only five-minute epoxy and a bit of Hot Stuff are needed). Basic framework is pre-built and then covered with a fully decorated pre-finished foam sheeting. You receive a fuselage, tail surfaces and wing in two pieces that are ready to fly. Cowling duties are handled by a three-piece plastic molding, as is the wing center section covering and belly pan. Some plywood parts and a complete hardware package are included. The tail surfaces and ailerons are already hinged. The motor mount is set in place and is capable of handling just about any size engine that can sensibly be installed. A very nice touch is that Telstar is already set for retracts and Royal mechanical units are recommended. I decided to stay with the fixed gear included, and for sport use it is not just satisfactory but the airplane is lighter, too.

CONSTRUCTION. Instructions are good with excellent line drawings to guide one through assembly. All parts fit together perfectly. I felt the three-piece cowl was a little flimsy but a little glass cloth and resin on the inside seams solved that problem. A lot of cutting and fitting was needed to get the cowl in place over the engine. The vinyl stripes for simulated-canopy framing were impossible to get on neatly and they constantly crept out of place. I substituted vinyl masking tape

that worked out fine.

Radio installation, in my case the Futaba Conquest 6NLK/Dual Rate*, was a snap with a very nice plywood plate to hold the fuselage servos. Pushrods must be made but this is a simple task. A two-prong yoke is used on the elevator pushrod—one for each elevator half. When made up, this piece is hard to get into place. Installation is eased by slipping two plastic tubes into each fuselage exit hole, leading them up to the radio compartment. The tubes are partially threaded onto each pushrod prong. When the plastic tubes are pulled out, they carry the elevator yoke into place. *Do* use the small brass tubes on all control horn installations to avoid crushing the soft foam.

I powered My Telstar with an Enya Super Sport 30 BB*. This is a light powerful two-cycle glow engine that *urges* this small bird along. Unlike other small Enyas I've had, the Super Sport didn't require a prolonged break-in. It was ready to go after a tank run. Even so, I expect this engine to last as long as other small Enyas—you just can't kill them. The carburetor set up easily and gave a low idle and smooth transition to high speed. I used a 10x6 Zinger prop and 10% Cool Power fuel.

When completed, Telstar weighed in at just over 4¼ pounds for a loading of 22 ounces per square foot—not bad for a solid-pattern bird. The wingspan is 50 inches and the area is 443 square inches. Telstar's airfoil is symmetrical. In setting it up I set CG and all surface throws as the instructions called for; they were just right.

FLYING. Telstar literally *flew* off the bench! Not so unusual, since its flight comes from good design-and-manufacturing procedures that leave little room for modeler foul-up. Just about any Telstar will fly exactly as any other Telstar; just be sure you glue the wing halves together accurately.

And that flying is just top-notch. The airplane rolls very well in either direction, pitch movements are among the smoothest I've ever called for, stall turns are crisp and clean, and snaps are quick but controllable—what more is there?

Telstar could be a pattern-winner but would suffer from the judging impression of a small airplane and probably from predjudices directed toward ARFs. Some folks just don't believe that that kind of airplane can be as good as the Telstar. No matter, Telstar is a winner at the local field. If you are flying the typical sport jobs and have wrung everything out of them, you may want to try a full-fledged pattern-type. Telstar will make any good sport flier a better sport flier with, perhaps, even higher aspirations.

Hope to see you at the pattern contest!

**The following are the addresses of the companies mentioned in this article:*

Royal Products, 790 W. Tennessee Ave., Denver, CO 80223.

Futaba Corp. of America, 555 W. Victoria St., Compton, CA 90220

Enya: Marketed by Altech Marketing, P.O. Box 286, Fords, NJ 08863. ■

ABOUT ENGINES

(Continued from page 47)

head as an optional extra. But by then it was too late. The Arden glowplug was well on its way to taking over from spark ignition and diesel motors, and the Drone died a quick death.

It seems odd that people knowledgeable and skillful enough to engineer and manufacture an intricate item like a model airplane motor could be so badly misguided at times. The fixed-compression head of the Drone was one example. Another was the "supercharger impeller"

found in the Ken .60 and the Scott Thunderbird, both of 1946-47 vintage. The Ken was a front-rotary type while the Thunderbird had a rear disc valve, but both contained fan-like impellers within their crankcases. The idea was that the whirling blades would act as superchargers: blowing greater volumes of fuel-air mixture into the cylinder than the conventional sort of lower end design could deliver.

It didn't work. Even if those tiny fans could have developed any effective pressure at all (which would have required them to spin at about ten times crankshaft speed to accomplish), both the Ken and the Thunderbird, in common with all other model engines of the time, had bypass ports that closed before their exhausts. Thus any possible pressure boost would simply dissipate out the exhaust after the bypass flow was cut off.

The Thunderbird and the Ken ran all right; but no better than say a Fox .59 or an Anderson Spitfire, and not as well as a McCoy .60 Redhead or a Hornet .60. Both went out of production around the end of 1947, and are rarely seen today, even in engine collections.

Model motor manufacturers have come up with many gimmicks, such as magnetos (Hornet), front-and-rear intake (Atwood Champion and Rogers Ram), remote needle valves (Fox 29R), twin spark plugs (Super Cyclone), and centrifugal fuel induction (Howler). All of these features must have seemed to offer some advantages, or they wouldn't have been put on the market. Yet none survived very long. The simpler engine configurations continue being made, year after year, while the offbeat types come and go.

Perhaps we're seeing something like this happening again today. Both O.S. and Enya are back producing "sport-type" engines, with lapped cast-iron pistons and plain sleeve bearings. This kind of engine may take a bit of careful running in to develop its full power potential; but if broken in right, will last almost forever. With no high-carbon-steel ball bearings to corrode or soft pistons to be ruined by a bit of ingested grit, this return to the tried-and-true two-cycle engine design prin-

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ABOUT ENGINES

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ciples may prove a blessing to non-competition model fliers—those of us who make up about 90% of the active modelers in America today. ■

FUNDAMENTALS

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in for the engine speed you desire. On the other hand, the elevator and rudder (or aileron) stick is spring-loaded and will return to neutral (centered) when released. So, most fliers use the right stick to fly the airplane and the left stick to control the engine speed. In the two-stick radio, I've shown the most widely used configuration, called Mode II. This employs throttle and rudder on the left stick and elevator and aileron on the right stick. The single stick shown on the right has the aileron-and-elevator arrangement like the four-channel/two-stick but the rudder is a movable control at the top of the stick. Motor control on the single-stick is on the upper right side of the transmitter. The single-stick transmitter normally is cradled in the left arm while the right hand does the flying (presuming you are right-handed), and the left forefinger is used to control the throttle. This is contrasted to both hands holding the two-stick transmitter and the sticks being manipulated by the thumb and forefinger of each hand. Some two-stick fliers use just their thumbs at the stick top to fly; it's really a matter of which feel suits you best.

Radio modulation selection is another question that comes up quite often. Currently, there are three modulation types in use: Amplitude Modulation (AM), Frequency Modulation (FM), and Pulse Code Modulation (PCM). Let me define them for you.

Amplitude Modulation is defined as the variation of the strength of the RF output of the transmitter at an audio rate. In other words, the RF energy has to increase and decrease in power. In today's RF transmitters, this is actually an On/Off signal which should be called Pulse Modulation (PM) or, more accurately, Pulse Position Modulation (PPM). But the important consideration is that the RF signal (carrier) is turned on and off and as such is amplitude modulated.

Frequency Modulation—The beauty of Frequency Modulation (FM) is that the signal (carrier) is always present, which will give inherent protection against noise and interfering signals. The FM carrier frequency can be changed (modulated) in the frequency domain such that the frequency can be changed at audio rates; the receiver then will accept modulated signals but reject noise.

Pulse Modulation or Pulse Code Modulation—The latest modulation technique introduced to our R/C Hobby Radios is PCM. Pulse Code Modulation in its simplest terms means that the transmitter signal is encoded into a stream of digital bits. This differs from the other forms of pulse modulation by requiring that the sample values of the signal be quantized into a number of levels and subsequently coded as a series of pulses for transmission. By selecting enough levels or channels, the quantized signal can be made to approximate closely the original continuous signal at the expense of transmitting more bits per sample. The PCM scheme lends itself readily to time multiplexing of channels and will allow widely different types of signals; however, synchronization is always required. This synchronization of the system can be on a single-sample or code-group basis. The synchronizing signal is usually inserted with a group of samples from different channels, on a frame or subframe basis. You can drop pulses but the transmitter synchronizing pulse train or code group always gets your transmitter receiver in synch to get the next set of orders to your servos. A microcomputer within the transmitter and another in the receiver know the code words. Therefore, it is very difficult to interfere with the signals of a PCM radio.

The conventional digital FM radio uses one pulse for every servo function which varies in accordance with the transmitter operational control signal. In contrast, the PCM system starts by using a code word for the first function. Then the information follows, consisting of a pulse train which is determined by the stick positions of the transmitter. The microcomputer in the receiver identifies the signal for the function and passes the information to the proper servo only if the code word received corresponds with the one stored in the receiver. The receiver computer is programmed to repeat the

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information received until the code word is identified and then pass it to the proper servo.

The receiver computer works at a very high speed. Therefore, all information on the stick or switch positions of the transmitter can be repeated at a very high rate in one second. Even if a code word is received not complete or incorrect several times because of interference, this will not have any adverse effect due to the high rate of repetition.

If degrees of interference are high such that the receiver does not get any information which can be identified as "correct" for more than one or two seconds, a fail-safe condition will be declared and all flying surfaces will be neutralized and the motor set to low. This feature can be turned off if desired.

Modulation selection is important if you are aware of known interference signals in your area such as high-power commercial broadcast transmitters or paging services. It could be worth your while to contact a local R/C club or hobby shop before buying a radio. How-

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ever, as a general rule of thumb, FM-PCM is least susceptible to interference, followed by FM and AM, in that order. Because of the noteworthy efforts of the Academy of Model Aeronautics, twelve RF frequency channels have been set aside for model aircraft use in the 72 MHz band and six frequencies in the 27 MHz band,and you'll see them listed in Fig. 3.

If you are going to fly a model airplane, your radio system should operate on one of the twelve 72 MHz frequencies shown or the six 27 MHz frequencies.

The prices of R/C systems can vary from $100 to over $800. PCM systems are complex with eight to 10 channels and are also expensive, but as I mentioned earlier, the number of channels is directly proportional to the price. Thus, you can buy a very fine four-plus channel two-stick radio for about $100. Several that come to mind are the Futaba* Conquest 4, Polk's* Aristocraft Challenger 720, Altech* Acoms 572 FM, Ace* Olympic 5, Hobby Shack* Cirrus 4 XL and Circus* 4 AM. If you have any questions, drop me a line and I'll try to answer.

Charlie Kenney, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

Futaba Corporation of America, 555 W. Victoria St., Compton, CA 90220.

Polk's Model Craft Hobbies, Dept. 20A, 346 Bergen Ave., Jersey City, NJ 07304.

Altech Marketing, P.O. Box 286, Fords, NJ 08863.

Ace R/C, 116 W. 19th St., P.O. Box 511C, Higginsville, MO 64037.

Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92728.

Circus Hobbies, 3132 S. Highland Dr., Las Vegas, NV 89109. ■

FOUR-CYCLE

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working against you are lean runs and in-flight stops. You need to richen the mixture to compensate for these problems. Left in the fuel line, a fuel filter can eventually lead to erratic starts, difficult-to-adjust needle valves, and generally poor runs. The problem is that it has done its job—you've been putting dirty fuel into the tank and it has filtered out so

much junk that it's clogged up. Reverse flushing is the immediate cure, and the permanent one is to leave it out of the in-plane fuel system completely.

Notice that I said "in-plane" fuel system, not the fuel system in general. The point is that if you fill the tank with clean fuel, you won't need an in-plane filter, right? Right! My way is to be extremely careful at all times not to let my fuel get contaminated with dirt, etc. I don't use the fuel out of the container it came in, rather I always transfer it to another previously flushed can, running it through *two* filters. You can let gravity do this for you; simply place the can being filled on the floor and the filler can on a stool or chair. Some plastic wrap around the can openings will keep things clean while the siphoning is going on.

I also filter the fuel once again, as it's being pumped from the field can into the airplane's tank. To ensure that the plane's plumbing is always clean, between flying sessions pull and plug all lines that are exposed to open air.

Another culprit in the fuel system can be that handy fuel bulb, especially if it's an *old* handy fuel bulb. If you use one to refuel your model, it should most definitely have a filter installed. I've actually seen engines full of strange residue inside, which came from an old red rubber fuel bulb which had started to deteriorate inside to the point of loading the fuel with particles of itself. The bottom line when it comes to a fuel system is that you can't keep it too clean!

On-Board Ignition

The next letter is from David L. Printz of Burr Ridge, Illinois, and asks about four-cycle engines and on-board ignition. David writes:

"Please respond with any ideas you have regarding my suspected problem. I believe that my on-board ignition system resulted in a plane crash.

"I was using a Hobby Shack EZ Super Chipmunk 40, an O.S. FS 90, a Futaba 6FGK, and an Ace NiLite III on-board ignition modified to include a separate switch in the glowplug line to remove the plug from the circuit during recharging.

"My Chipmunk flew 88 flights without the on-board ignition (OBI), with no radio problems. I decided to add the OBI to

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obtain a reliable low idle and eliminate the random dead-sticks.

"After adding the OBI, I experienced radio interference, wild movements of the throttle, rudder, ailerons, and elevator, with the engine running. I didn't even attempt a takeoff.

"I made some adjustments to the throttle/OBI linkage and returned to the field. This time, I saw no interference while on the ground. Upon takeoff I saw interference in aileron control, so I throttled back and landed. On the ground it behaved properly. Upon the next takeoff I reached about an 8-foot altitude when it rolled and went in. Total loss of Chipmunk.

"Based on my lack of experience and input from others, I suspect that the OBI wiring might have allowed RF from the plug to affect the receiver. Others have advised that the plug could generate RF as a result of its reaction to heating/cooling when in operation, and that my wiring carried this RF back to the receiver antenna.

"The receiver and OBI wiring were in close proximity to each other in the fuselage. In fact, the OBI wiring laid on top of the receiver antenna wire near the

receiver case.

"The real questions are can the OBI produce RF interference and how can it be eliminated?"

Without David's unfortunate experience to prove me wrong, my initial answer to his first question would be an unqualified no! I must now qualify that somewhat and say that a *properly installed and working system* would *not* cause any RF interference. I've done extensive flying with a Kavan FK-50 with fire on the plug at idle, without the first sign of radio interference. My equipment is the Kraft 7C and KPR8FD receivers. That's right, I said receivers, plural. I use dual airborne systems in my large expensive birds, but that's another story.

Anyway, nary a sign of problems. Theoretically, such problems shouldn't exist, as a constant flow of direct current such as that found in this type of circuit is incapable of producing RF noise. Neither would such noise be produced by the heating/cooling mentioned, which actually doesn't take place when the OBI is in operation. If at all, a small "spike" might be produced as it's turned On or Off, but it would be felt as a momentary glitch and not as steady interference.

Which brings us to one of the probabilities. Something was making intermittent contact—a make-and-break situation in this type of circuit *could* generate RF noise. A poor solder connection, a vibration-sensitive switch, or even the plug itself could have an open coil which touched intermittently, often enough to keep itself lighted. Running the OBI wiring next to the receiver antenna aggravated the situation; this is a definite no-no. Never ever run the antenna next to anything metallic. Up and away is the only way for an efficient antenna installation.

There are some other points to ponder here. I don't always agree with the "blame-the-radio" syndrome that many of us live with, but let's face it, R/C systems do fail. In this case, it would have been a worthwhile test to fly *without* the OBI. Maybe the R/C system had reached its time!

I know everything seems to point to the OBI as the culprit. After all, it was the last thing to be added, at which point interference reared its ugly head. However, again assuming a correct installation, it was only used in the idle position, which was definitely not in use during the last moments of David's ill-fated Chipmunk! Let's run through that again. How could the OBI produce interference when it wasn't operating when the crash occurred?

I know that in effect I'm leaving you with an "I ain't got it!" As we all know, you can't always explain the reason for a crash. Even without a firm answer to David's questions, I thought this was important enough to mention in the hopes that it'll give roots to some ideas that will

NAME THE PLANE CONTEST

Can you identify this aircraft?

If so, send your answer to **Model Airplane News,** Name the Plane Contest (state issue in which plane appeared), 632 Danbury Rd., Wilton, CT 06897.

In the early 1940s the Air Force was looking for a fast bomber and Douglas Aircraft submitted their XA-42—our October 1986 mystery plane—for trials. It was 53 feet long and had a wingspan of 70 feet. Powered by two Allison V-1710-125 engines mounted in the fuselage, the airplane set a transcontinental speed record of 5 hours, 17 minutes, 34 seconds in 1945 with Lt. Col. H.E. Warden and Capt. Glen W. Edwards at the controls. Dubbed "the Mixmaster" due to huge counter-rotating props, the airframe was later redesigned and two J35-GE-3 jet engines installed, thus becoming the first U.S. Air Force jet bomber, as the XB-43. Only two were built, SN 43-50224 and 43-50225.

Congratulations to Col. William C. Ferguson (Retired) of Port Angeles, Washington, for correctly identifying our mystery aircraft. Other correct entries were received from Kendall Thomas, Marshall Smith, George Younger, Peter Zotos, and many others.

The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail. If already a subscriber, the winner will receive a free one-year extension of his subscription.

FOUR-CYCLE

keep at least one of you from losing a bird as nice and as well equipped as David's.

Dual Glow Driver

On the subject of glowplugs, I can give a definite answer to the next question, which comes from Harvey Goff of Plainfield, Indiana:

"I own two O.S. twin-cylinder engines and have had trouble finding a suitable glow driver to supply two plugs. Can you help?"

Well, Harvey, as I stated earlier, I fly a Kavan twin with similar requirements. I have two suggestions, both backed by extensive personal experience. One is the Sonic-Tronics* Vari-Pulse Power Panel, which will handle two glowplugs very nicely. It requires a series connection to them; that is, one wire to each plug, nothing to ground. The circuit is completed by the engine itself.

My other recommendation is the Kavan unit, which is made especially for the FK-50, and which actually contains two individually adjustable driver units. It's available from Hobby Shack*. One way or another, keep those plugs glowing, guys. See you here next month!

Eloy Marez, c/o *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

Perry Aeromotive, 1568 Osage St., San Marcos, CA 92069.

Small Parts, Inc., 6901 N.E. Third Ave., Miami, FL 33238.

Sonic-Tronics, 7865 Mill Rd., Elkins Park, PA 19117.

Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92728. ■

Club of the Month

RIVER CITY RADIO CONTROL
MASON CITY, IOWA.

If you take Interstate 35 out of Des Moines, Iowa, and travel 130 miles north, you will come upon a small community of 33,000 Americans who call their town Mason City. One mile east of Mason City is the home of the River City Radio Control Club, our "Club of the Month" for December 1986.

Club president Dave Balek insists that if you died and went to heaven you would end up at their flying field, which is 3-acre tract of grass that is located one-half mile from the nearest tree, which is fine with club treasurer Don Fuller since he seems to have trouble keeping his quarter-scale Sig Cub out of the bean field and finds the tree convenient in locating his lost airplanes. Newsletter Editor Les Hesley also says that if Don ever gets his inverted low pass act together he has standing offers from some local farmers for him to plow their fields. So far Don has declined the offer, but not ruled it out. Don McAfee wanted to volunteer but still can't figure out how to get the nose back on his airplane with scotch tape and a coat hanger, as Carl Weitmon suggested.

Hobby shops that support the club are D&B Hobbies and C&A Hobbies, both of Mason City. The club recently participated in a display of their models at South Bridge Mall in Mason City, and have helped in community affairs in order to inform the public about this great hobby.

Model Airplane News is pleased to award two free one-year subscriptions, which are to be given by the club to their deserving junior members.

Congratulations!

Each month **Model Airplane News** will select the club newsletter that best shows the club's activities and energies directed toward the furtherance of the hobby. The award is not based on size or quality of the newsletter, and can be about any aspect of the hobby (F/F, C/L, R/C, boating, cars, etc.). **Model Airplane News** will award two free one-year subscriptions to be given by the club to outstanding junior members. So send your newsletter to **Model Airplane News,** Club of the Month Contest, 632 Danbury Rd., Wilton, CT 06897.

R/C NEWS

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⅓ ounce all contestants will be faced with the same volume requirements rather than introducing one 'lead package' that would strongly affect design.

"9. By using two cargo compartments contestants will be able to divide the load in the front and rear compartments to maintain aircraft balance. This is done all the time in real life.

"10. And, in this event, weight carried wins as in real life [of airline cargo carriers]. Beating the schedule does not pay off. Burning up extra fuel to land early and then waiting for the other airplanes of the system to land does not make sense. Also, weight only makes for easier judging.

"I would hope that a weight event would be an incentive to return to well-built lightweight structures. A light structure means a greater payload. I would also hope to see good streamlining for less drag and less fuel burned for a given speed. Less fuel aboard means greater payload. Perhaps it might be necessary to specify the weight of the radio gear to prevent undue competition in this area."

Thanks, Steve and Ted, for your comments. Now all we need is a design and I'm sure the right one will be accepted by *Model Airplane News* for publication. Ted has provided the "woof" and "warp," all we must do is develop the "fabric." It's all one of the most exciting concepts in R/C in years; certainly an event for the "thinking man." Andy Lennon, where are you?

Art Schroeder, c/o *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897. ■

GOLDEN AGE

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suggests that this effort commenced sometime before the Templehof exhibition.

While I'm on the subject, I'd be remiss if I didn't tell you of a long-ago discussion with Frank Schmidt of Erie, Pennsylvania. This also will serve as a lead-in to Frank's contribution to the early reed multichannel systems. A news item in an early-'50s *Model Airplane News* made me aware that Frank was developing a reed system and was only a one-and-a-half-hour drive away. I found Frank Schmidt to be both a fine gent and, at age 50, life-long-dedicated modeler. At this time he was an accomplished electronics expert, having worked in the field since before WW I. He and his son were operating an electronics service. I was fortunate to enjoy this great man's friendship for the remainder of his life, which, unfortunately, was to be only another five years.

In Frank's presence you *knew* you were with one of the early pioneers of R/C. I asked him when he got started, and the question led to a delightful, lengthy discussion that I can never forget. First, Frank went to the attic and brought down his remaining "OT R/C." What he had was a ready-to-*recover* skeleton of a 7-foot span model with a Brown Jr. in the nose. In the cabin was an obvious receiver that looked like the guts of a vintage table radio with its several large tubes. Being an embryonic radio, the operating details didn't look familiar, but the control actuators did ring a bell. There were two controls, rudder and elevator. At the fuselage both control surfaces had small metal plates on each side. Two electromagnets for each surface were mounted to provide full control deflection. Operation was about as simple as could be energize a magnet and the control would move to full deflection. A spring returned the surface to neutral. There must have been some form of coding provided to discriminate between the four magnets. The machine was precise workmanship and a system that radiated flyability. Frank said there had been successful flights in 1935. When asked why the project had been sidetracked, he said the weight and cost of batteries were prohibitive. (This is because magnets and big tubes consume vast amounts of current.)

However, it turned out that this wasn't his first endeavor: In 1923 Frank was a model airplane builder, with a modeler's dreams. He also was an electronics man

with considerable machinist's skills. He envisioned a radio-controlled model airplane in the days before the twin-pusher was invented!... He spent months planning, devising an R/C system, and then a plane for the system. Also, an engine would have to be designed and built. Anyone up for a project like this today? To shorten the story...Frank put the R/C system together using state-of-the-art components of the time. Range with fine-tuning was 400-500 feet. The 9-foot span model was also completed, leaving only the engine to be built—when personal problems brought it all to a halt, for a while. With these problems resolved, Frank decided to see if the plane would fly before getting into the extensive engine-building.

The answer was to rig the plane as a glider and launch it into a pasture from a barn roof! Apparently he made several successful glides with the R/C system showing turning ability *within its range.* While enthused with his success, it was obvious to Frank that a 40-foot range wouldn't be sufficient for powered flight. Thus, he terminated the project, setting aside his R/C ideas until a far later date when radios would be much-improved.

Frank Schmidt became terminally ill at the peak of his reed system production. He turned to the hobby of model steam engines, a life-long interest. His determination to build in this area extended his life for several years.

And what have we learned about the first R/C? No concrete facts, no determination, you say? Probably true. But it's an insight into the very beginning that tells *who* we can thank for the great effort it took to get us off the ground. Some of these people, such as Dr. Good, Clinton Desoto, and Frank Schmidt, continued their efforts and with commercial endeavors provided the rest of us with equipment that enables all of us to join in this great hobby. We've never really paid them their worth, but we can now thank them for what we have!

Chronologically, I've covered the R/C beginning, the single-channel phase, and post-single-channel, all milestones marking great moments of progress. The first would have to be the '37 Nats, when a few modelers showed that R/C was *possible.* Then, a few years later, others joined to show that it was all *practicable.* World War II added terrific developments that so improved post-war R/C. Then there were two more events that marked explosions of interest. The first

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Classified

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SIX NEW 1" = 1' CONSTRUCTION BLUEPRINTS for "flying-scale" aircraft. Large SASE for details. S.A. Lambert Jr., Apt. 308, 2200 W. Cornwallis Dr., Greensboro, NC 27408; 919-288-2944.

WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063.

R/C SCALE PLANS: Curtiss P6E, Curtiss Gulfhawk, others—1/6-scale $22.50, 1/4-scale $35.50, catalog $1. Richard Barron, 11506 Ohio Ave., Youngtown, AZ 85363.

SCALE DRAWINGS of flying wings and other unique aircraft. Send $2 for catalog to: Bill Young, 8106 Teesdale Ave., No. Hollywood, CA 91605.

FOR SALE: Brazilian-produced T.M., Sassi, Mobral glo engines, .15, .40, .46, S.T.D. and R/C. Udo Eugen Linke, Caixa Postal 24, 18.130—Sao Rogue S.P. Brasil.

SELL CHOICE PERSONAL ANTIQUE gas model ignition engine collection, $3,900 or best. 1½-hour video (VHS only) describing all engines. Video tape only $49.95 plus $2. Jule Dews, 7703 Baltimore National Pike, Frederick, MD 21701.

FOR SALE: New and used Kraft System radios. All have been thoroughly gone over with new Ni-Cds, etc. Many other brands of U.S. made R/C equipment. Send SASE for current listings. We still have need for used American-made radios, especially Kraft 7C and 5C. Only 25 Channel Master Systems left at our bargain price of $125 per set. 8FD receivers and FM modules now only $100 per set. Outrageous discounts on Schluter Helicopters and parts through our new affiliation with Alikas Helicopter Service here in Hilo. Jay-En R/C Sales, P.O. Box 4248, Hilo, HI 96720; 808-966-6175 (after 5:00 p.m. Mon. through Fri., all day Sat. and Sun.).

BEGINNERS, discouraged by too-fast R/C "trainers"? Send $1 and a stamp for evaluation of over 20 well-known models rated for their ease-of-flying. James Waterman, 3818 Deerfield Dr., San Antonio, TX 78218.

FOR SALE: 12-page listing of model airplane mags., books, plans, etc. One dollar plus SASE with 37-cent stamp. J. Willard Vaughn, 506 Wadsworth St., Radford, VA 24141.

BALSA WOOD AT ½ PRICE: 161 measures to choose from: 36", 48" lengths, shipped to you AIR-MAIL from South America. Send $1 for catalog and price list. Dealers wanted. Morello Trading Co., P.O. Box 640, Palmira, Colombia.

WANTED: T-2 Buckeye ducted-fan kit or plans originally by D&B Model Aircraft. Ron Hodges, 2316 Oakbark St., Miamisburg, OH 45342.

FOR SALE: *Flying Aces* 1935-1944, *Model Airplane News* 1931-1960, others. $1 for list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada M5M 1W3.

BOOKS FOR MODELERS. Out-of-print/current, 400+ items list $1. John Roby, 3703B Nassau, San Diego, CA 92115.

NYLON MACHINE SCREWS, nylon wire ties, polyethylene glue guns. Free lists. Transmotions, Inc., P.O. Box 160M, North Hollywood, CA 91603.

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GOLDEN AGE

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came with the citizens' band, which allowed anyone to participate—and thousands did. The second explosion came with the availability of multi-control, through reed systems. We're at that point now, when today's form of R/C actually began. We should set the stage so you'll have a clear picture of what, how, and why it happened as it did.

At this point R/C was relatively widespread; R/Cers of the time were anxious to move ahead. Other modelers indicated they'd like R/C if the flying was more like full-scale, instead of just guided free-flights. The need was there and the potential great enough to support the possible solution.

Multi-control models would be heavier and, as a result, fly faster. Drawing on the gains in know-how, motor-powered servos would be incorporated to provide the power and reliability needed for these new-breed models. Fortunately, "hardware" had become available to make such servos possible. The major need had been for a miniature DC motor that would be adaptable. Help came from outside our own industry. The toy industry was having great success with economical, powered toy vehicles of all sorts. The answer was a mass-produced, battery-operated, miniature DC motor of good quality. At about this time, too, the Japanese were shocking the home movie industry with a pen-cell-powered camera that required no winding. Again, the secret lay in a quality motor suited to our servo requirements. Consumer demand for these new products was great enough to allow separate companies to specialize in miniature motor production. The motors became available to R/C through these companies even though quantities needed for R/C were insignificant.

At that time, one manufacturer reported production of 100,000 motors *per day*. In comparison, a recent report indicates a rise to 1,000,000!

As with all new ideas, the servos evolved from crude beginnings to neat, reliable packages. However, the basic concept didn't change. These servos were as different in operation from today's units as could be. There was a high-speed motor geared down to provide needed torque and desired output speed. With two double-throw relays and servo switches, the motor could be commanded to rotate clockwise and counterclockwise, providing control movement in both directions.

After that, the need was to limit the output movement and to have it return to the starting point (neutral) on command. The answer was switches operated by the servo output in series with the relay contacts. To change a motor's directional rotation the voltage polarity must be switched; so a separate relay was required for each polarity. The normally open relay contact through the servo limit switch provided control deflection with one polarity. The same relay's normally closed contact through the neutral switch furnished opposite polarity, returning the output to neutral. Thus, with a command signal the relay N.O. contact would close, running the servo to full deflection where the limit switch opened, thereby stopping it. Upon release of the signal, the N.C. relay contact closed and the servo ran back until the neutral switch opened. The second of the two relays responded to a *different* command signal and provided control in the *opposite direction* in the same manner.

Back then two radio channels were required for each control, unlike today—now one channel does the same job. In use, these servos proved quite reliable and were even versatile. Limit switch adjustment could be set the amount of deflection desired. With neutral switch adjustments the neutral dead band could be widened. With a wide neutral you could have an effective elevator trim by "beeping" the transmitter control lever, which would in turn move the center position within the dead band. The servos also were quite efficient, providing ample power and you could easily get a day's flying out of four pen cells.

With the servos as the heart of the

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